

Plymouth

1964 SERVICE TECHNICAL MANUAL



Valiant

Plymouth and Valiant

SERVICE TECHNICAL MANUAL

MODELS

VP-1 (Savoy, Belvedere, Fury (6 Cyl)
VP-2 (Savoy, Belvedere, Fury (8 Cyl)
VV-1 (V-100, V-200, Signet 200 (6 Cyl)

This Service Technical Manual is compiled as a reference and guide to provide the Plymouth and Valiant Service Technicians with the proper adjustments and repair procedures for servicing the 1964 Plymouth and Valiant Vehicles. An understanding of the contents, and Service Technical Bulletins issued from time to time, will assist the service personnel to maintain the quality standards built into the Plymouth and Valiant vehicles. The previous corresponding and superseding vehicle Models must be understood in order to use the Service Technical Manual to the best advantage. The supersedence of these Models is as follows:

PLYMOUTH MODELS

	1964		1963
Savoy (6-Cyl)	VP-1	Savoy (6-Cyl)	TP-1
Belvedere (6-Cyl)	VP-1	Belvedere (8 Cyl)	TP-1
Fury (6-Cyl)	VP-1	Fury (6-Cyl)	TP-1
Savoy (8-Cyl)	VP-2	Savoy (8-Cyl)	TP-2
Belvedere (8-Cyl)	VP-2	Belvedere (8-Cyl)	TP-2
Fury (8-Cyl)	VP-2	Fury (8-Cyl)	TP-2
Sport Fury (8-Cyl)	VP-2	Sport Fury (8-Cyl)	TP-2

VALIANT MODELS

	1964		1963
V-100 (6-Cyl)	VV-1	V-100 (6-Cyl)	TV-1
V-200 (6-Cyl)	VV-1	V-200 (6-Cyl)	TV-1
Signet	VV-1	Signet	TV-1

The service tools referred to in this Manual are available through the Miller Manufacturing Company, 17640 Grand River Avenue, Detroit 27, Michigan, U.S.A. unless otherwise specified.

Extra copies of this Manual are available at $5.00 each under Part Number 81-570-4450. Order from Chrysler-Plymouth Division, Service Department, P.O. Box 1658, Detroit 31, Michigan.

PLYMOUTH DIVISION CHRYSLER MOTORS CORPORATION

Chrysler Corporation reserves the right to make changes in design or to make additions to or improvements in its product without imposing any obligations upon itself to install them on its products previously manufactured.

LITHO IN USA
35M SD & TO-8-63

QUICK REFERENCE INDEX. To use, move either the hand or selection tool directly over the section you desire to reference. Simply click once with the mouse button and the manual will automatically jump to that section.

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23	Body and Sheet Metal
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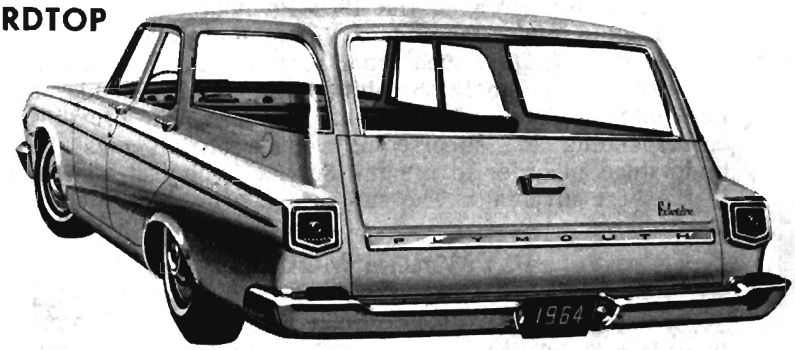
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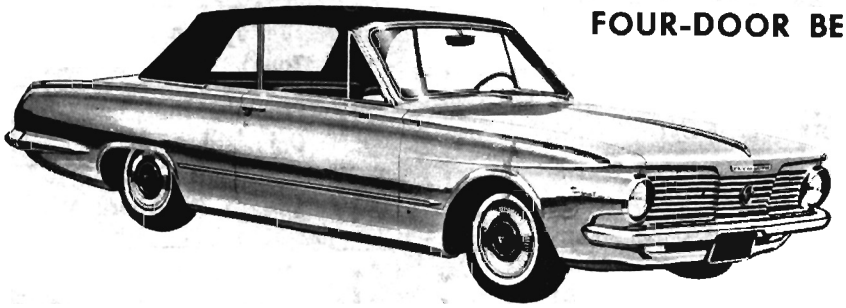
PLYMOUTH SPORT FURY CONVERTIBLE



PLYMOUTH FURY TWO-DOOR HARDTOP



FOUR-DOOR BELVEDERE STATION WAGON



VALIANT SIGNET 200 CONVERTIBLE COUPE



VALIANT V-100 TWO-DOOR SEDAN

64 x 551

Fig. 1—1964 Plymouth and Valiant Models

FACTORY CONTACT

The following outline of the proper procedure to use in obtaining assistance or advice on any matter applying to Service will insure your inquiries receiving prompt attention and handling. Make certain those members of your organization who might have the occasion to contact either your Regional Office or the factory, are thoroughly familiar with this procedure. All matters pertaining in any way to Warranty Service Claims, or of a technical nature, should be handled by you direct with your Regional Service Office. When in doubt as to the proper procedure to follow in the handling of a claim or complaint, prompt results can be obtained through a letter, telegram or phone call to your Regional Service Office—making certain to include all necessary information. If the aid of a Service Representative is necessary, the Regional Office will arrange for his contact as promptly as circumstances permit.

Letters or telegrams to the Regional Service Office, should be confined to one subject only and include the following information:

Car Serial Number
Date of Sale
Owner's Name
Mileage

Complete description of difficulty, corrective action taken, your recommendations as to what should be done and the reason for so doing.

Include Paint and Trim Code Numbers where finish, upholstery, body or sheet metal is involved, and estimate of net cost of repairs.

CHRYSLER-PLYMOUTH DIVISION

With the exception of orders for parts or parts literature, all requests for Imperial, Chrysler, Plymouth or Valiant Service literature such as Service Bulletins, Service Manuals, Owner Manuals, Time Schedules, W.S.C.'s or other Chrysler—Plymouth Division Service Literature, should be addressed to:

(Letters)

Chrysler Corporation
Chrysler - Plymouth Division
Service Department
P.O. Box 1658
Detroit 31, Michigan

(Telegrams)

Chrysler - Plymouth Division
Attention,
(Name of person to whom sent)
WUX
Detroit, Michigan

(Phone) 822-4700

NOTE: Please make certain to include the Code WUX on all telegrams to the Chrysler-Plymouth Division as this insures delivery direct to our Teleprint Room thus eliminating delay.

MASTER TECHNICIANS SERVICE CONFERENCE

All correspondence concerning enrollment in the M.T.S.C. Program, issuance of awards, orders for additional material, the return of reports, or any other matters relating to this program, should be addressed to:

Master Technicians Service Conference
Chrysler Corporation Training Center
P.O. Box 2119
Detroit 31, Michigan
(Phone) 539-3000

PARTS DIVISION

General

ALL orders for parts or accessories, emergency or otherwise, should be forwarded direct to your usual source of supply or to the parts plant listed below serving the area in which you are located.

To insure your receiving the parts required by you more promptly, close attention should be given to the procedure listed under "Ordering Information" and "Your Parts Orders" in the introductory front part of all MoPar Parts lists and Price Lists. Particularly where parts are ordered for a specific car, it is very essential that your order include the serial and engine numbers, and in the case of body parts, the body number.

CENTER LINE, MICHIGAN
Mail Address:
Chrysler Motors Corporation
P.O. Bix 300
Center Line, Michigan
Telephone — 539-3000

SAN LEANDRO, CALIFORNIA
Mail Address:
Chrysler Motors Corporation
1955 Davis Street
San Leandro, California
Telephone — Neptune 8-6200

NEWARK, DELAWARE
Mail Address:
Chrysler Motors Corporation
South College Avenue
P.O. Box 120
Newark, Delaware
Telephone — Endicott 8-2521

ATLANTA, GEORGIA
Mail Address:
Chrysler Motors Corporation
1150 Murphy Avenue, S.W.
P.O. Box 10786
Atlanta 10, Georgia
Telephone — Plaza 5-2531

KANSAS CITY, KANSAS
Mail Address:
Chrysler Motors Corporation
Funston & Chrysler Roads
Kansas City 15, Kansas
Telephone — Fairfax 1-3300

Parts Division Literature

Request for Parts Division literature such as Parts Books, Parts Price Lists, Parts Bulletins, etc., should be forwarded direct to:

Chrysler Motors Corporation
P.O. Box 1718
Detroit 31, Michigan
Attention: Parts Catalog Department

Shortage of Accessories or Other Equipment on New Cars

Before placing an order for missing accessories, other parts or equipment, on new cars received, examine the vehicle for the presence of a "back order" notice, which if present, will be found attached to the bracket for the inside rear view mirror. Such back-ordered short items will be shipped from the assembly plant as soon as stock is available, and should not be ordered from the Parts Division.

Emergency Orders—Car Down or Truck Down

1. When parts are not immediately available from your local MoPar source of supply, TELEPHONE, TELEGRAPH or AIR MAIL your order to:
   a. PARTS PLANT SERVING YOUR AREA for parts coded "V", "F", "M" and "P". Use Parts Order Form No. 81-670-0139.
   b. FACTORY PARTS PLANT AT CENTER LINE for all parts coded "D" . . . and orders for "D" parts combined with "V", "F", "M" and "P" parts required for an individual service job. Use Parts Order Form No. 81-670-0190 (supersedes D-16712).
   c. Quantities ordered should not exceed actual requirements for vehicle out of service. **Always supply car, vehicle serial number and Truck Parts Availability Number (1960-62 Models) in addition to Vehicle Serial Number.**
2. Identify orders as "Emergency Car Down" or "Emergency Truck Down".
3. List part numbers in numerical sequence. Use your dealer code number on all orders. Assign only one order number to the order regardless of size.
4. "V", "F", "M", and "P" parts will be shipped transportation charges collect. "D" parts will be shipped transportation prepaid when "Normal Prepaid Transporation" is specified; shipped collect when "Premium Transportation"' is specified.

VEHICLE AND ENGINE NUMBERS

VEHICLE NUMBER: The vehicle number (serial number) is located on a plate attached to the left front door hinge pillar post (Fig. 2).

All vehicle number contain ten digits. The vehicle number is a code which tells the make of car (1st digit), model of car (2nd digit), year built (3rd digit), assembly plant (4th digit) and vehicle sequence number (last six digits.



Fig. 2—Vehicle Number Plate

1st Digit Make of Vehicle	2nd Digit Model of Vehicle		3rd Digit Year Built	4th Digit Assembly Plant
	Valiant	Plymouth	1964	1 and 3 Detroit
1. Valiant	1. V-100	Savoy		5. Los Angeles
	2. —	Belvedere		
2. Plymouth (6 Cyl.)	3. V-200	Fury		6. Delaware
	4. Signet 200	Sport Fury		
3. Plymouth (8 Cyl.)	5. V-100 Sta. Wagon	Savoy Sta. Wagon		7. St. Louis
	6. —	Belvedere Sta. Wagon		
	7. V-200 Sta. Wagon	Fury Sta. Wagon		

ENGINE NUMBER: The 170, 225, 361, 383 and 426 engine numbers contain the model, cubic inch displacement and manufacturing date, Figs. 3 and 5. The 318 engine number contains the model, cubic inch displacement and serial number. (Fig. 4). The numbers are stamped on a boss on the cylinder block as shown.

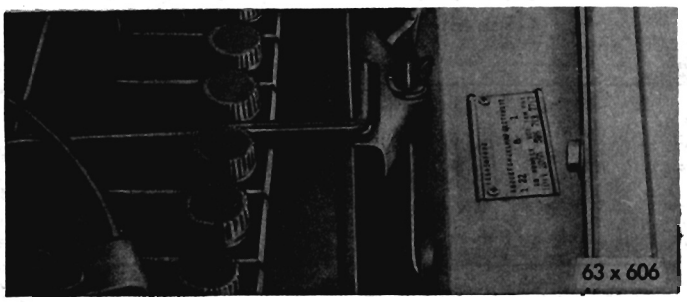


Fig. 3—Engine Number Location (170 and 225 Cu. In. Eng.)



Fig. 4—Engine Number Location (318 Cu. In. Eng.)

BODY NUMBER: The body number plate is located on the fender shield near the battery. The numbers contain the body number, trim number and the paint code. (Fig. 6)



63x606

Fig. 6—Body Number Plate Location

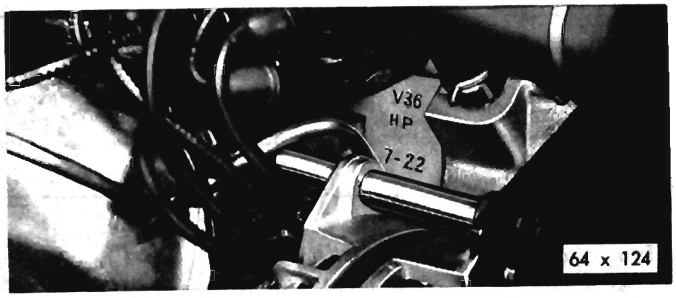


Fig. 5—Engine Number Location (361, 383 and 426)

GENERAL DATA AND SPECIFICATIONS

Item	Body Style	VP-1 Plymouth 6-Cyl.	VP-2 Plymouth 8-Cyl.	VV-1 Valiant 6-Cyl.
	Two Door Sedan	Savoy, Belvedere	Savoy, Belvedere	V-100 V-200
	Two Door Hardtop	Belvedere, Fury	Belvedere, Fury, Sport Fury	Signet 200
	Convertible Coupe		Sport Fury	V-200, Signet 200
	Four Door Sedan	Savoy, Belvedere, Fury	Savoy, Belvedere, Fury	V-100, V-200
	Four Door Hardtop		Fury	
	Station Wagon	Savoy	Savoy, Belvedere, Fury	V-100, V-200
Wheelbase	All Models	116"	116"	106"
Tread (Front)	All Models	59.5"	59.5"	55.9"
Tread (Rear)	All Models	59.6"	59.6"	55.6"
Length with Bumper	All Models except			
	Station Wagons	206.5"	206.5"	188.2"
	Station Wagons	210.1"	210.1"	188.8"
Width with Bumper	All Models except			
	Station Wagons	75.6"	75.6"	70.1"
	Station Wagons	75.1"	75.1"	70.1"
Rear Axle with Manual Transmission 3-Speed or 4-Speed	All Models except			
	Station Wagons	3.31"	(3-Speed) 2.93"	(Economy) 2.93"
			(4-Speed) 3.23"	(Performance) 3.23"
	Station Wagons	3.23"	(3-Speed) 2.93"	(Economy) 2.93"
			(4-Speed) 3.23"	(Performance) 3.23"
Rear Axle with TorqueFlite Transmission	All Models except			
	Station Wagons	2.93"	2.76"	3.23"
	Station Wagons	3.23"	2.76"	3.23"
Tire Size	All Models except			
	Station Wagons	7.00x14,2 Ply	7.00x14,2 Ply	6.50x13,2 Ply
	Station Wagons	7.00x14,4 Ply	7.00x14,4 Ply	6.50x13,2 Ply

LUBRICATION AND MAINTENANCE CHART

NORMAL SERVICE

Engine Coolant—Check level and/or Anti-Freeze every 2 months. Cooling system pressure, 14 pounds; with air conditioning, 16 pounds.

Battery (Check Level) every 2 months.

PSF **Power Steering Reservoir** (Check Level). Fill to the bottom of the filler neck (every 6 months).

EO **Engine Oil** (Change) every 2 months (not to exceed 4,000 miles).

Multigrades

SAE 10W-30 Suitable year around for most parts of the country may be used as low as −10°F.

SAE 5W-20 Recommended if temperatures are consistently below +10°F.

Single grades

SAE 30 When temperatures are consistently above 32°F.

SAE 10W When temperature ranges average between 32 and −10°F.

SAE 5W When temperatures are consistently below −10°F.

Carburetor Air Filter (Clean every 6 months). Not to exceed 8,000 Miles (Replace Element) Every 2 years, not to exceed 32,000 miles.

MP **Manual Steering Gear** (Check Level) Above −30° 80; below −30°, 75 (every 6 months).

HTF **Brake Master Cylinder** (Check Level) Fill to ¼-inch below top of reservoir (every 6 months).

MML **Front Suspension Ball Joints** (every 6 months). Inspect seals for damage, replace if necessary. After replacing seal or when relubricating, remove plug, use adapter. Install plug.

(Every 32,000 Miles) Relubricate using special adapter. Fill until grease flows from upper ball joint bleed holes or lower joint seal lower lip. Do not rupture seals. Reinstall plug.

MML **Steering Linkage Pivot Seals** (every 6 months). Inspect seals for damage, replace if damaged or worn. Relubricate every 32,000 miles.

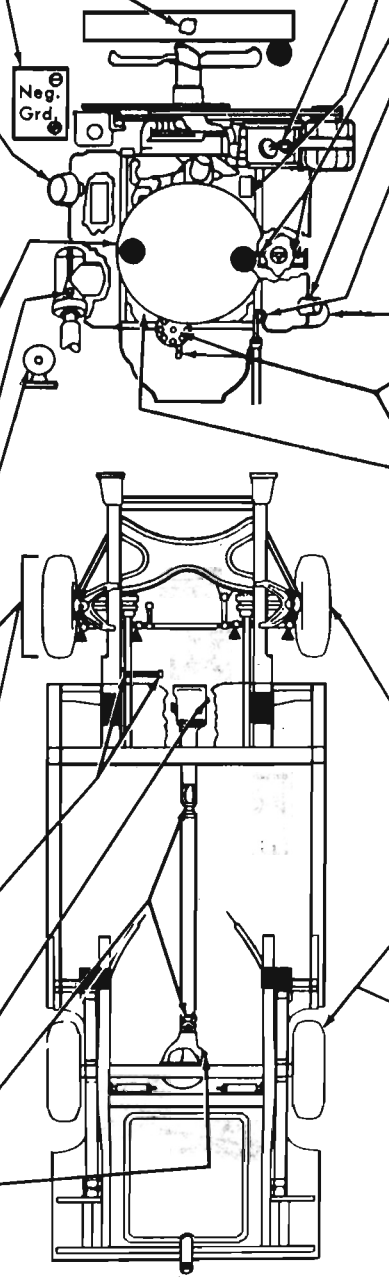
AMG **Clutch Torque Shaft** (every 32,000 Miles). Relubricate shaft bearings and release fork.

AMG **Clutch Release Fork Swivel** Clean swivel and swivel socket and Clutch release fork and lubricate when disassembling.

AA **Manual Transmission** (Check Level) every 6 months. Maintain level to fill plug hole. Use MP for Heavy Duty Manual Transmission.

MML **Universal Joints** every 6 months, inspect seals for leakage. Relubricate as necessary.

MP **Rear Axle and Sure-Grip** (Check Level) every 6 months. Above −10°, 90; as low as −30°, 80; below −30°, 75. Maintain level ½-inch below fill plug hole. (MHL can also be used on all axles.)



Crankcase Dipstick . . . Check level when refueling.

Carburetor Fuel Filter (Replace) 16,000 Miles or once each year.

S **Manifold Heat Control Valve** treat with solvent every 6 months.

Crankcase Ventilator Valve (Inspect) Every 6 Months. (Replace) Once a Year.

AA **Automatic Transmission** every 6 months. Check level, engine idling and thoroughly warm, NEUTRAL position. To overcome difficult starting below −10°, replace 1½ pints fluid with kerosene. Do not dilute more than once during any one season.

MCC **Carburetor Choke Linkage and Shaft** (Every 6 months) Apply to choke shaft through the air horn.

Engine Oil Filter Element (Replace) every 6 months to coincide with an oil change.

DCL **Distributor** (Every 10,000 Miles) Apply to cam and rubbing block.

EO **Distributor Oil Cup and Wick** under Rotor (Every 10,000 miles.)

Engine Tune-up every 10,000 Miles or once each year.

Body Hardware (every 6 months).

DPO **Door and Tailgate Hinges and Rotors.**

SL **Striker Plates and Torsion Bar Roller Cams.**

ML **Hood Hinges and Locks—License Plate Mounting Springs—Fuel Tank Cover.**

EO **Deck Lid Latch.**

WB or AMG **Front Brake Assemblies and Front Wheel Bearings.** (Inspect) Every 20,000 miles or every two years.

Tighten front wheel adjusting nut to 90 in.-lb., position lock nut over adjusting nut so that one set of slots on lock nut aligns with drilled hole in axle spindle. Back off adjusting and lock nuts one slot and install cotter key.

TIRES . . . . . Pressure	Front	Rear
7.00-14	24	22*
7.00-14	22	26

*Station Wagon, 26; increase rear tire pressure 4 pounds when fully loaded.

Rotate Tires using spare every 5,000 Miles.

CAPACITIES

Engine Oil (Add 1 qt. when replacing filter element)		4 qts.
Cooling System (Add 1 qt. for heater)		20 qts.
Rear Axle		4 pts.
Transmission (refill)		
TorqueFlite		20 pts.
Manual	3-Speed	4½ pts.
	4-Speed	7 pts.

■ Position for lift adapter

▲ Prepacked bearing

● Cooling system drain

PLYMOUTH V-8

64 x 668

KEY TO LUBRICANTS

AA	**Automatic Trans. Fluid Type "A" Suffix "A"**
AMG	**Automotive Multi-Purpose Grease**
CL	**Chassis Lubricant**
DCL	**Mopar Cam Lubricant**
EO	**Engine Oil**
HTF	**High Temperature Brake Fluid**
MCL	**Speedometer Cable Lubricant**
MHL	**MoPar Hypoid Lubricant**
ML	**Lubriplate**
MML	**MoPar Multi-Mileage Lubricant**
MP	**Multi-Purpose Gear Lubricant**
DPO	**Dripless Penetrating Oil**
PSF	**Power Steering Fluid**
S	**Manifold Heat Control Valve Solvent**
SL	**Stainless Stick Lubricant**
WB	**Wheel Bearing Lubricant—Medium**
MMC	**Mopar Carburetor Cleaner**

Fig. 1—Plymouth V-8 Lubrication Chart

LUBRICATION AND MAINTENANCE CHART

NORMAL SERVICE

Engine Coolant—Check level and/or Anti-Freeze every 2 months. Cooling system pressure, 14 pounds; with air conditioning, 16 pounds.

Battery (Check Level) every 2 months.

PSF **Power Steering Reservoir** (Check Level). Fill to the bottom of the filler neck (every 6 months).

Carburetor Fuel Filter (Replace) 16,000 Miles or once each year.

Crankcase Dipstick . . . Check level when refueling.

MCC **Carburetor Choke Linkage and Shaft** (Every 6 months) Apply to choke shaft through the air horn.

S **Manifold Heat Control Valve** treat with solvent every 6 months.

Carburetor Air Filter (Clean every 6 months). Not to exceed 8,000 Miles (Replace Element) Every 2 years, not to exceed 32,000 miles.

MP **Manual Steering Gear** (Check Level) Above —30°, 80; below —30°, 75 (every 6 months).

HTF **Brake Master Cylinder** (Check Level) Fill to ¼-inch below top of reservoir (every 6 months).

Engine Tune-up every 10,000 Miles or once each year.

MML **Front Suspension Ball Joints** (every 6 months). Inspect seals for damage, replace if necessary. After replacing seal or when relubricating, remove plug, use adapter. Install plug.

(Every 32,000 Miles) Relubricate using special adapter. Fill until grease flows from upper ball joint bleed holes or lower joint seal lower lip. Do not rupture seals. Reinstall plug.

MML **Steering Linkage Ball Joints** (every 6 months). Inspect seals for damage, replace if damaged or worn. Relubricate every 32,000 miles.

AMG **Clutch Torque Shaft** (every 32,000 Miles). Relubricate shaft bearings and release fork.

AMG **Clutch Release Fork Swivel** Clean swivel and swivel socket and Clutch release fork and lubricate when disassembling.

AA **Manual Transmission** (Check Level) every 6 months. Maintain level to fill plug hole. Use MP for 4-Speed Manual Transmission.

MML **Universal Joints** every 6 months, inspect seals for leakage. Relubricate as necessary.

MP **Rear Axle and Sure-Grip** (Check Level) every 6 months. Above —10°, 90; as low as —30°, 80; below —30°, 75. Maintain level to fill plug hole. (MHL can also be used on all axles.)

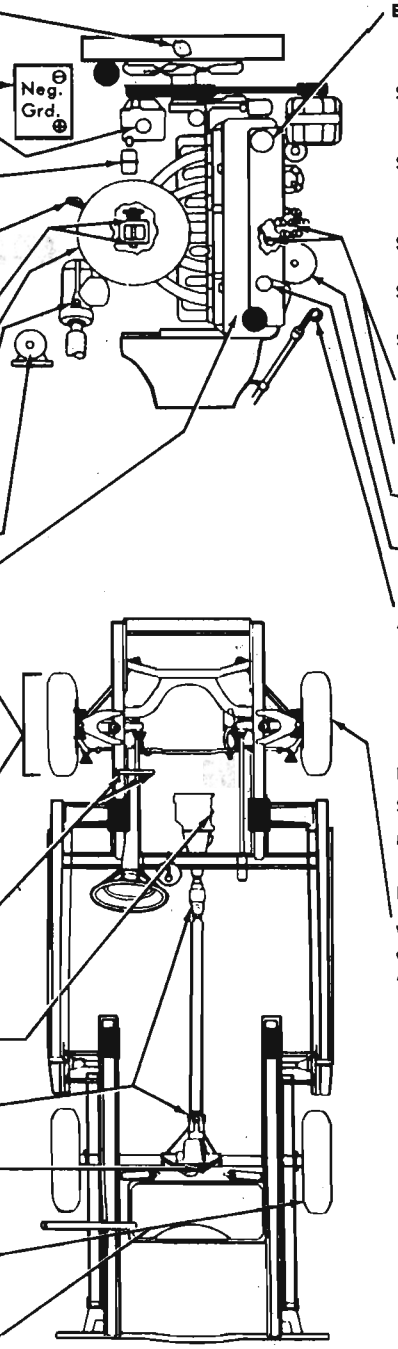
Tires	Pressure	Front	Rear
6.50-13		24	24*
7.00-14	Plymouth Station Wagon	24	26*
7.00-14		24	22

*Station Wagons increase rear tire pressure 4 lbs. when fully loaded.

Rotate Tires using spare every 5,000 Miles.

CAPACITIES

Engine Oil (Add 1 qt. when replacing filter element)		4 qts.
Cooling System (Add 1 qt. for heater)	Valiant	11 qts.
	Plymouth 6	12 qts.
Rear Axle	Valiant	2 pts.
	Plymouth 6	4 pts.
TorqueFlite 6		18 pts.
Manual— 3-Speed—	Valiant	7 pts.
	Plymouth	6-4.5 pts.
4-Speed—	Valiant	7 pts.
	Plymouth	6-7 pts.



(Valiant chassis shown)

■ Position for lift adapter

▲ Prepacked bearing

● Cooling system drain

PLYMOUTH 6 VALIANT

64 x 671

Fig. 2—Plymouth, Valiant 6-Cylinder Lubrication Chart

EO **Engine Oil** (Change) every 2 months (not to exceed 4,000 miles).

Multigrades

SAE 10W-30 Suitable year around for most parts of the country may be used as low as —10°F.

SAE 5W-20 Recommended if temperatures are consistently below +10°F.

Single grades

SAE 30 When temperatures are consistently above 32°F.

SAE 10W When temperature ranges average between 32 and —10°F.

SAE 5W When temperatures are consistently below —10°F.

DCL **Distributor** (Every 10,000 Miles) Apply to cam and rubbing block.

EO **Distributor Oil Cup and Wick** under Rotor (Every 10,000 miles.)

Engine Oil Filter Element (Replace) every 6 months to coincide with an oil change.

Crankcase Ventilator Valve (Inspect) Every 6 Months. (Replace) Once a Year.

AA **Automatic Transmission** every 6 months. Check level, engine idling and thoroughly warm, NEUTRAL position. To overcome difficult starting below —10°, replace 1½ pints fluid with kerosene. Do not dilute more than once during any one season.

Body Hardware (every 6 months).

DPO **Door and Tailgate Hinges and Rotors.**

SL **Striker Plates**

ML **Hood Hinges and Locks—License Plate Mounting Springs**

EO **Deck Lid Latch.**

WB or AMG **Front Brake Assemblies and Front Wheel Bearings.** (Inspect) Every 20,000 miles or every two years.

Tighten front wheel adjusting nut to 70 in.-lb. on Valiant 6 and 90 in.-lb. on Plymouth 6, position lock nut over adjusting nut so that one set of slots on lock nut aligns with drilled hole in axle spindle. Back off adjusting and lock nuts one slot and install cotter key.

KEY TO LUBRICANTS

AA	Automatic Trans. Fluid Type "A" Suffix "A"
AMG	Automotive Multi-Purpose Grease
CL	Chassis Lubricant
DCL	Mopar Cam Lubricant
EO	Engine Oil
HTF	High Temperature Brake Fluid
MCL	Speedometer Cable Lubricant
MHL	MoPar Hypoid Lubricant
ML	Lubriplate
MML	MoPar Multi-Mileage Lubricant
MP	Multi-Purpose Gear Lubricant
DPO	Dripless Penetrating Oil
PSF	Power Steering Fluid
S	Manifold Heat Control Valve Solvent
SL	Stainless Stick Lubricant
WB	Wheel Bearing Lubricant—Medium
MMC	Mopar Carburetor Cleaner

GROUP 0

LUBRICATION AND MAINTENANCE

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SUMMARY OF LUBRICATION AND MAINTENANCE SERVICES

Maintenance and lubrication services recommendations for the 1964 Chrysler Corporation cars have been compiled (designed etc.) to provide maximum protection to vehicle owners against all types of driving conditions. These, as well as driving habits, are so varied that to prescribe the lubrication and maintenance services on a mileage basis only did not take care of those who drove fewer miles during equal length time periods, especially during adverse weather conditions.

These recommendations, therefore, have been related to the best of our ability to time intervals, yet limited by mileage where necessary. In general, semi-annual lubrication and maintenance services have been prescribed for most items. Exceptions to this include two month intervals between engine oil changes (not to exceed 4,000 miles) opposed to the front suspension lubrication every 32,000 miles.

CERTIFIED CAR CARE

Certified Car Care is a thorough servicing program that helps make sure the vehicles you sell get the regular attention you know they need.

Certified Car Care helps build business for you in the surest way known - through customer satisfaction, not to mention the extra profits from the service department. Tell your owner that the best approach to trouble-free driving is Certified Car Care . . .

A practical plan to build sales and service for you, providing for regular customer service at your dealerships.

CAPACITIES CHART

Make	No. Cyl.	Model		Cooling System Qt. (a)	Crank-case Qt. (b)	Fuel Tank Gal.	Manual Trans. 3-Speed Pt. (c)	Manual Trans. 4-Speed Pt. (c)	Torque Flite (Pt.)	Rear Axle Pt.	Tires Size Stand. Equip.	Tires Pres-sure Front	Tires Pres-sure (psi) Rear
Valiant	6	VV1-L	V100 Sed. & Sta. Wag.	11*	4	18	6	7	18	2	6.50x13	24	24***
	6	VV1-H	V200 Sed. & Sta. Wag.	11*	4	18	6	7	18	2	6.50x13	24	24***
	6	VV1-P	Signet 200	11*	4	18	6	7	18	2	6.50x13	24	24
Plymouth	6	VP1-L	Savoy	12	4	19	6	7½	18	4.0	7.00x14	22****	22
	6	VP1-L	Savoy Sta. Wag.	12	4	21	6	7½	18	4.0	7.00x14	24	26***
	6	VP1-M	Belvedere	12	4	19	6	7½	18	4.0	7.00x14	22****	22
	6	VP1-M	Belvedere Sta. Wag.	12	4	21	6	7½	18	4.0	7.00x14	24	26***
	6	VP1-H	Fury	12	4	19	6	7½	18	4.0	7.00x14	22****	22
Plymouth	8	VP2-L	Savoy	20	4	19	4½**	7½	20	4.0	7.00x14	24	22
	8	VP2-L	Savoy Sta. Wag.	20	4	21	4½**	7½	20	4.0	7.00x14	24	26***
	8	VP2-M	Belvedere	20	4	19	4½**	7½	20	4.0	7.00x14	24	22
	8	VP2-M	Belvedere Sta. Wag.	20	4	21	4½**	7½	20	4.0	7.00x14	24	26***
	8	VP2-H	Fury	20	4	19	4½**	7½	20	4.0	7.00x14	24	22
	8	VP2-H	Fury Sta. Wag.	20	4	21	4½**	7½	20	4.0	7.00x14	24	26***
	8	VP2-	Optional Commando Pkg.	16	4	19	4½**	7½	20	4.0	7.00x14	24	22

*Power Pack 12 qts.

(a) Add one quart for heater.

(b) Add one quart when filter is changed.

(c) Initial Fill.

**3 pints for High Performance Engines.

***When fully loaded, increase pressure Cold 4 pounds.

****22 pounds 6-Cyl Sedans and Station Wagons.

LUBRICATION AND MAINTENANCE SERVICE

Service Interval	Item	Service				
		Replace	Inspect Fluid Level	Inspect and/or Clean	Lubricate	Service
2 Months	Engine crankcase oil (not to exceed 4,000 Miles)	X				
6 Months	Engine oil filter	X				
	Oil filler air cleaner			X	X	
	Manifold heat control valve				X	
	Crankcase ventilator valve			X		
	Carburetor choke shaft & linkage			X		
	Transmission		X			
	Rear axle		X			
	Steering gear		X			
	Steering linkage			X		
	Universal joint			X		
	Prop. shaft spline			X		
	Brake master cylinder		X			
	Brake hoses			X		
	Carburetor air cleaner (not to exceed 8,000 Miles)			X		
1 Year	Engine Performance Evaluation (not to exceed 10,000 Miles)					X
	Fuel filter (not to exceed 16,000 Miles)	X				
2 Years	Brake linings (not to exceed 20,000 Miles)			X		
	Carburetor air cleaner (not to exceed 32,000 Miles)	X				
32,000 Miles	Ball joints, front suspension & steering linkage				X	
	Clutch release fork pivot				X	
	Clutch torque shaft bearings				X	
When Necessary	Body mechanisms				X	
	Speedometer cable				X	
	Manual gearshift linkage				X	
	Front wheel bearing (with brake service)			X	X	
	Parking brakes					X
	Clutch linkage & pressure plate drive lugs				X	

1. ENGINE OIL

Lubricants are classified and graded according to standards recommended by the Society of Automotive Engineers (SAE), the American Petroleum Institute (API) and the National Lubricating Grease Institute (NLGI).

The SAE grade number indicates the viscosity of the lubricant (Example, SAE 30). Engine oils may have a dual number, one of which is SAE 10W-30. This marking indicates that the oil is comparable to SAE 10W, SAE 20W and SAE 30 grades.

Both the SAE number and the MS designation should be marked on the container.

Complete information pertaining to the lubrication points, is shown in Figures 1 and 2, for the Plymouth and Valiant Models.

2. SELECTION OF LUBRICANT

For best performance and to provide for maximum protection of all engines, for all types of operation, only those lubricants should be selected which; conform to the requirements of the API Classification "For Service MS". **Straight mineral or non-detergent oils never should be used.**

Have the proper SAE grade number for the anticipated temperature range.

Although all viscosity grades can be used safely at nearly all temperatures, light oils SAE 5W and 10W increase oil consumption at high temperatures and heavy oils SAE 30 make engine starting more difficult in cold weather. The recommended viscosity grades are:

Multigrades—SAE 10W-30	Suitable year around for most parts of the country may be used as low as —10° F.
SAE 5W-20	Recommended if temperatures are consistently below + 10° F.
Single grades SAE 30	When temperatures are consistently above 32° F.
SAE 10W	When temperature ranges average between 32 and —10° F.
SAE 5W	When temperatures are consistently below —10° F.

Lubricants which do not have both an SAE designation and an MS service classification shown on the container should not be used. The proper viscosity number should be selected based on the lowest temperature expected during the coming period of usage.

3. FREQUENCY OF OIL CHANGES

Chrysler Corporation recommends that engine oil be changed at least every two months. Cars driven more than 2,000 miles per month should have the engine oil changed at a maximum of 4,000 miles. If the cars are operated under unusual conditions, the owner should consult the local dealer's Service Manager to determine the best program to follow.

The two most important factors which effect oil life, aside from oil quality, are: Engine temperature and type of driving.

At low engine temperatures harmful condensation and sludge-forming impurities accumulate in the engine oil. These cause corrosion of vital engine parts and harmful deposits. Highway driving produces higher engine temperatures which dissipate these impurities. Short trip driving at slower speeds does not warm the oil sufficiently to drive off these contaminants. Therefore, short trip driving at lower temperatures decreases the effective life of the oil while highway driving extends the effective lubricant life.

For example, highway driving, and longer trips permit oil changes at 4,000 mile intervals. Short trips (less than 10 miles) and slow speeds, such as to the store, school, work etc, and home again before the oil warms up causes harmful condensation and sludge formation. This is typical of most city operation. Oil changes should be made at intervals no longer than

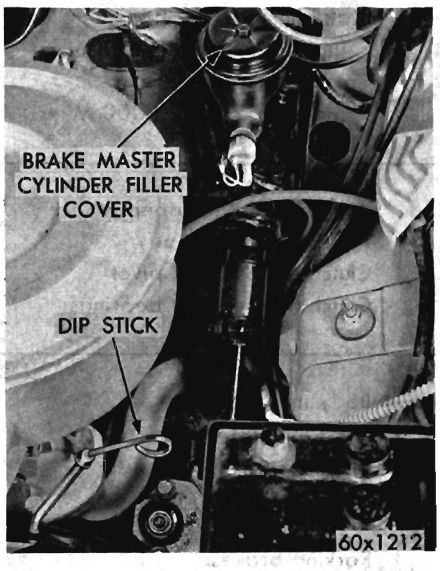


Fig. 3—Engine Oil Level Dipstick (6-Cyl.)

every two months.

Severe operating conditions such as frequent driving on dusty roads or in sandy geographic areas or unusually short trips in cold weather will require more frequent service.

During Break-In—The oil added to the engine at the factory is a high quality lubricant, classified for "Service MS". It should be retained for two months or 4,000 miles, whichever comes first. If it becomes necessary to add oil during this initial period, an oil for "Service MS" and of the proper viscosity grade should be used (Fig. 3). "Non-Detergent" or "Straight mineral" oils should not be used during the break-in period.

Frequently a new engine will consume some oil during its first few thousand miles of operation. This should be considered as a normal part of the break-in, and not interpreted as an indication of difficulty.

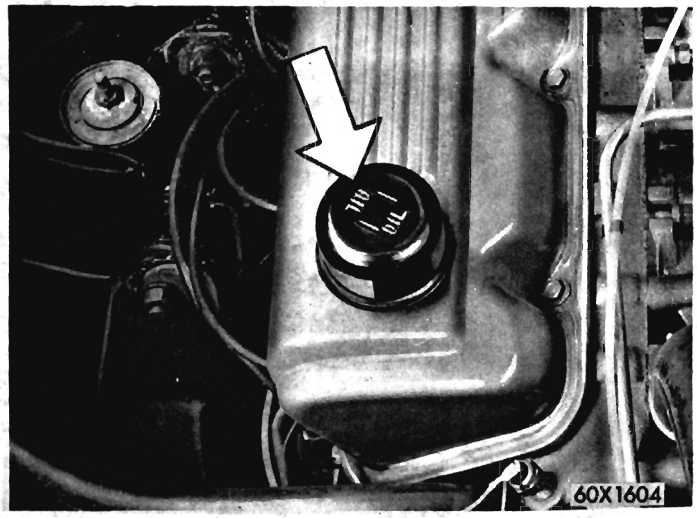


Fig. 5—Engine Oil Filler Cap Air Cleaner (6-Cyl.)

4. AIR CLEANERS

Oil Filler Cap

Engines require ventilation through the crankcase to remove combustion products. Air enters the engine through the oil filler pipe which is equipped with a combination cap and air cleaner to protect the engine from dust laden air. The oil filler cap should be washed in kerosene and re-lubricated with SAE 30 engine oil every 6 months (Figs. 4 and 5). Cars which are operated in extremely dusty areas should be serviced more frequently.

Carburetor Air Cleaner

The paper element carburetor air cleaner should be inspected every 6 months, not to exceed 8,000 miles and cleaned as often as conditions warrant and a new element should be installed every 2 years not to exceed 32,000 miles (Figs. 6 and 7).

After removing the air cleaner from the carburetor, remove the cover and the filter element, clean the housing and cover with compressed air. Using compressed air, gently clean the paper element by holding the air nozzle at least two inches from the inside screen. Examine the paper element for punctures. Discard an element that has a little as a pin-point puncture. Examine the soft plastic sealer on both sides of the element. These sealing surfaces must be smooth and uniform. Refer to Paragraph "Carburetor Choke" linkage and shaft for servicing at this time.

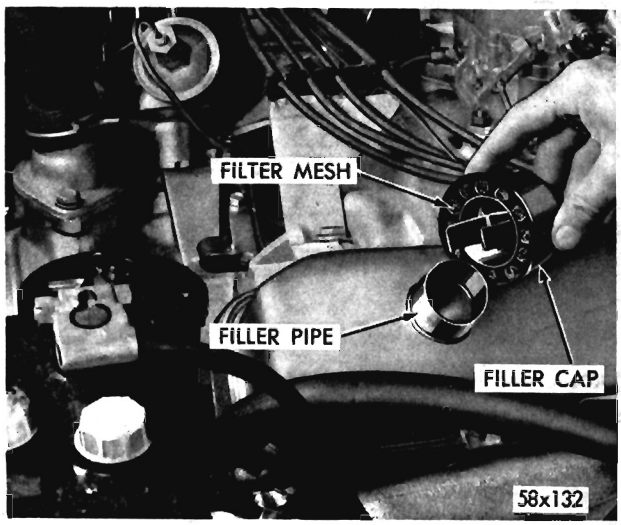


Fig. 4—Engine Oil Filler Cap Air Cleaner (8-Cyl.)

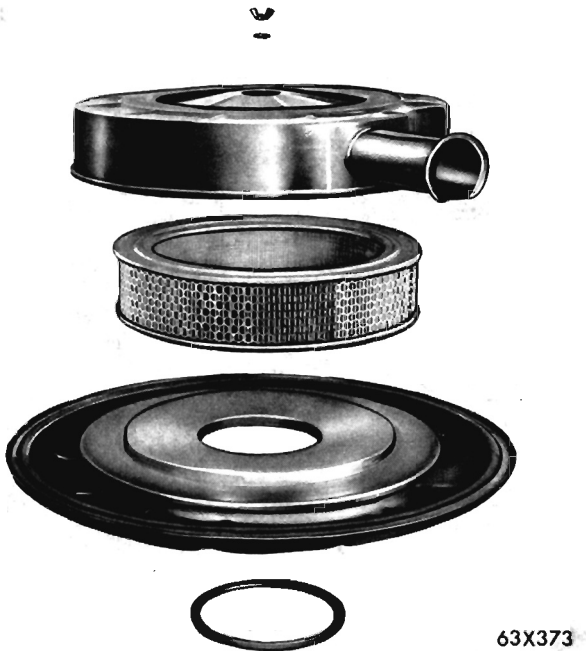


Fig. 6—Carburetor Air Cleaner (8-Cyl.)



Fig. 7—Carburetor Air Cleaner (6-Cyl.)

5. CARBURETOR CHOKE LINKAGE AND SHAFT

Every 6 months apply MoPar Carburetor Cleaner, Part Number 1643273 to prevent the choke sticking from gum deposits on the choke shaft.

Remove the air cleaner and apply the cleaner while moving the choke blade back and forth until gum formation is flushed out. Apply the cleaner to the choke shaft where it rotates in the air horn to remove gum and dirt from these surfaces.

Run the engine at idle to clean out any excess from the system. Refer to Paragraph "Carburetor Air Cleaner" for servicing at this time.

6. CRANKCASE VENTILATOR VALVE

All models are equipped with a positive crankcase ventilating system. This system is similar, but not identical, to systems used on the previous models (Fig. 8).

The system must be kept clean to maintain good engine performance and durability as deposits will accumulate in the valve, hoses and the carburetor parts, therefore, the ventilation system should be inspected at least every six months and the valve replaced once a year preferable to coincide with the annual engine performance evaluation. This service will be required more frequently if the vehicle is used extensively for short trips - driving less than 10 miles - with frequent idling, such as city traffic.

With the engine running at idle, remove the ventilator valve and cap assembly from the rocker cover. If the valve is not plugged, a hissing noise will usually be heard as air passes through the valve and a strong vacuum should be felt when a finger is placed over the valve inlet. Replace the ventilator valve and cap assembly and remove the inlet breather cap. With the engine still running at idle, loosely hold a piece of stiff paper or a parts tag over the oil fill pipe. It should be sucked against the oil fill pipe with a noticeable force. If this occurs, a final test should be made to be certain the valve shuttle is free. A clicking noise should be heard when the valve is shaken (engine not running). If the noise is heard, the unit is satisfactory and no further service is necessary.

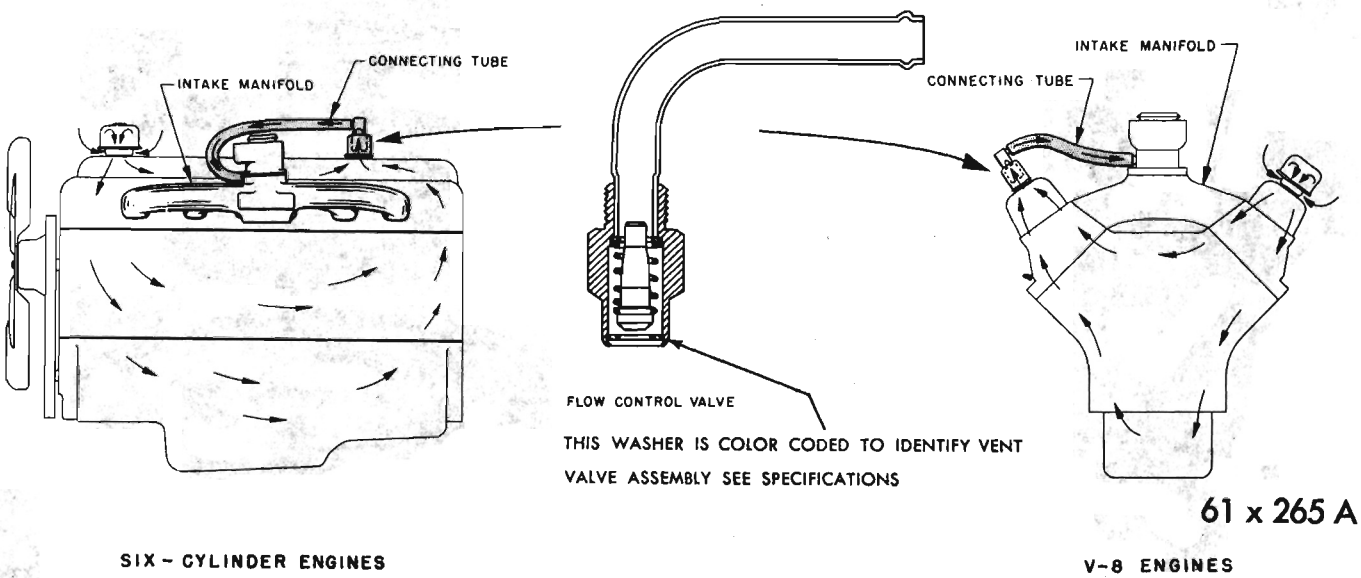


Fig. 8—Closed Crankcase Valve Schematic (6 & 8 Cyl.)

If the valve does not click when shaken or if the paper is not sucked against the fill pipe, the valve should be replaced and the system retested (Do not attempt to clean the valve). On 170 cubic inch engines use MoPar Ventilator Valve identified by a stamped number 6 on the end, a step on the end face, or a white end washer. On all other engines, use MoPar Ventilator Valve, identified by a letter "H" stamped on the end, a flat end or a black end washer. With a new valve installed, if the vacuum can be felt with the engine idling, the system is satisfactory. If the vacuum cannot be felt, it will be necessary to clean the ventilator hose and the passages in the lower part of the carburetor. The carburetor must be removed and cleaned by dipping the lower part of the carburetor in solvent. A pipe cleaner or small wire may be used in cleaning the passages. It is not necessary to disassemble the carburetor for this service.

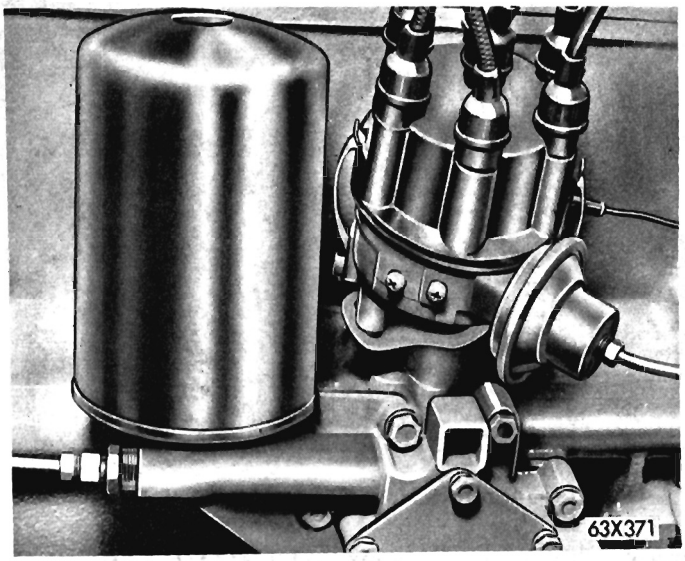


Fig. 10—Engine Oil Filter (6-Cyl.)

7. ENGINE OIL FILTER

Efficient filtering of the engine oil is very important to provide good engine protection (Figs. 9 and 10). The oil filter should be replaced at a maximum of 6 months to coincide with an engine oil change. Short trips, stop and go operation, or operation in dusty areas may require more frequent filter changes. All engines are equipped with a full-flow oil filter. Filters vary widely in quality, and it is recommended that MoPar Engine Oil Filter, Part Number 1851658 be used, to assure the most efficient service.

8. FUEL FILTER

The fuel filter (Figs. 11 and 12) should be replaced

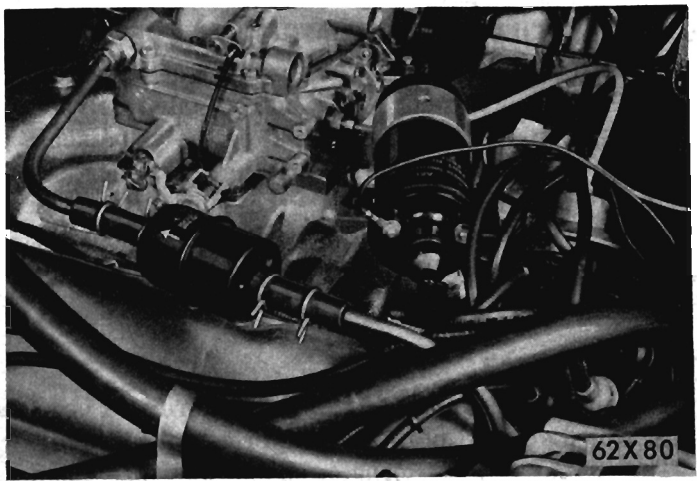


Fig. 11—Fuel Filter (8-Cyl.)

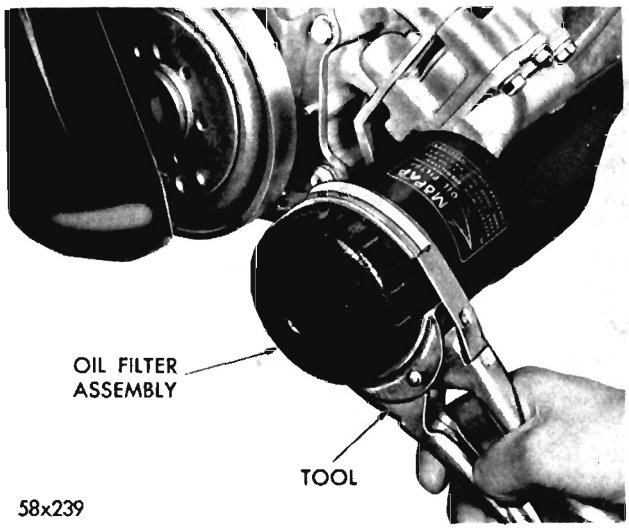


Fig. 9—Engine Oil Filter (8-Cyl.)

at least every 16,000 miles or once each year. Loss of performance may occur if the filter traps an unusually large quantity of foreign matter due either to opera-

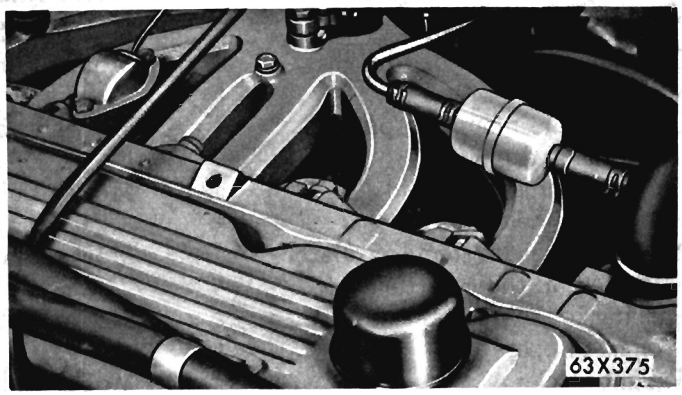


Fig. 12—Fuel Filter (6-Cyl.)

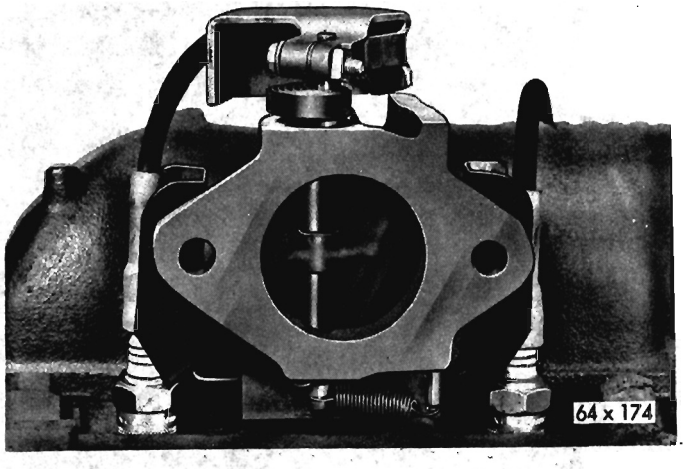


Fig. 13—Manifold Heat Control Valve (8-Cyl.)

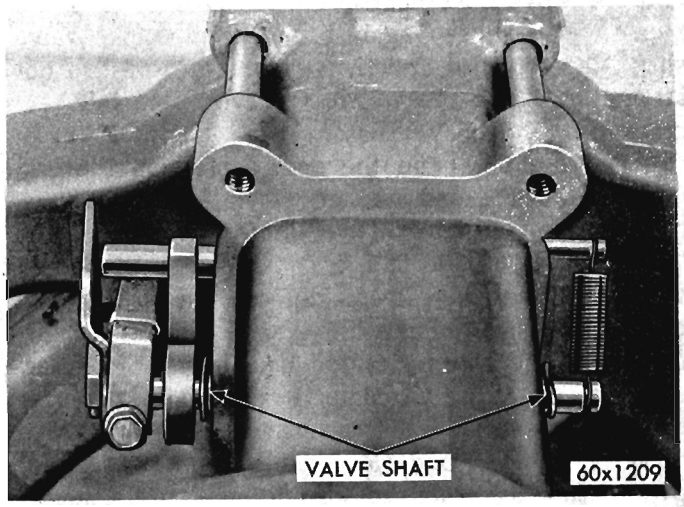


Fig. 14—Manifold Heat Control Valve (6-Cyl.)

ting conditions or contaminated fuel, restricting the flow of fuel to the carburetor. If this occurs the filter should be replaced as required.

9. MANIFOLD HEAT CONTROL VALVE

Every 6 months or more often under adverse conditions, apply Manifold Heat Control Valve Solvent, Part Number 1879318 to each end of the valve shaft when the manifold is COOL. Work the valve back and forth a few times to distribute the solvent to make sure the lead deposits are dissolved (Figs. 13 and 14).

NOTE: Apply manifold heat control solvent only when the exhaust manifold is COOL.

10. ALTERNATOR

The alternator is equipped with pre-lubricated bearings, which require no periodic lubrication servicing.

The outside of the alternator should be wiped clean and the ventilating holes inspected for an accumulation of dirt which would obstruct the flow of air (Servicing the Alternator, Refer to Group 8, "Electrical" for complete servicing of the Alternator).

11. BATTERY

Refill the battery as necessary with distilled water and test the specific gravity. Clean and tighten the battery cable, terminals and the battery posts. Refer to Group 8, "Electrical" for complete servicing.

12. BODY MANTENANCE

To maintain ease of operation and protection against rust and wear, the body mechanism and throttle linkages will require lubrication every 6 months. Prior to applying any lubricants, the parts should be wiped clean to remove dust and grit. The excess oil or lubricant should be removed.

Particular attention should be given to external lock cylinders during fall and winter months to insure protection from water and ice.

Lubricate the following:

Item	Type of Lubricant	Remarks
All external lock cylinders	MoPar Lubriplate	Apply directly.
Door check arms, hood hinges and lock	MoPar Lubriplate	Apply directly, use sparingly.
License plate mounting panel springs and pin	MoPar Lubriplate	Apply directly, use sparingly. Plymouth only.
Engine exhaust manifold mounted bellcrank	MoPar Lubriplate	Apply directly to bearing surfaces. Plymouth only.
Accelerator shaft sound insulator located on the throttle shaft	MoPar Lubriplate	Apply to exterior surfaces of insulator. Valiant only.
Parking brake mechanism foot or hand operated	MoPar Lubriplate	Apply a light film directly.
Tailgate locks	MoPar Lubriplate	Apply to inner surfaces through access hole, use sparingly.

Item	Type of Lubricant	Remarks
Ball joint at top of accelerator pedal rod—passenger side of firewall	MoPar Lubriplate	Apply directly to ball joint. Valiant only.
Throttle control bellcrank passenger side of firewall	MoPar Lubriplate	Apply directly to bearing surfaces.
Plastic bushing on throttle linkage passenger side of firewall	MoPar Lubriplate	Apply between bushing and throttle linkage rod. Valiant only.
Deck lid latch	Engine Oil	Apply to inner surfaces, use sparingly.
Door hinges and other hard to lubricate places	Engine Oil	Apply directly. Do not apply to ramp or outside of roller.
Door latch rotor	Engine Oil	Apply 2 or 3 drops to outside and inside rotor bearing surface.
Tailgate hinges	Engine Oil	Apply directly, use sparingly.
Door lock striker plates	MoPar Stainless stick lubricant	Apply directly to upper edge of plate on door frame.
Tailgate lock striker plates and dovetail surfaces	MoPar Stainless stick lubricant	Apply directly.
Tailgate torsion bar and support arm guide pillars	MoPar Stainless stick lubricant	Apply directly, use sparingly Plymouth and Valiant Station Wagons.

13. BRAKES

All Models have self adjusting brakes so that major brake adjustments are unnecessary.

Brake linings should be inspected for wear every 20,000 miles or every 2 years or more frequently if severe brake use is experienced. At the time of brake lining inspection, the contact area of the brake shoes to brake backing plate should be lubricated with a very thin film of MoPar Sylglyde, Part Number 1881923. For this operation, the brake shoes must be removed, and the contact areas cleaned and smoothed with sandpaper before applying lubricant.

Brake hoses should be inspected for cracking, abrasions, cuts or tears in the outer covering every 6 months.

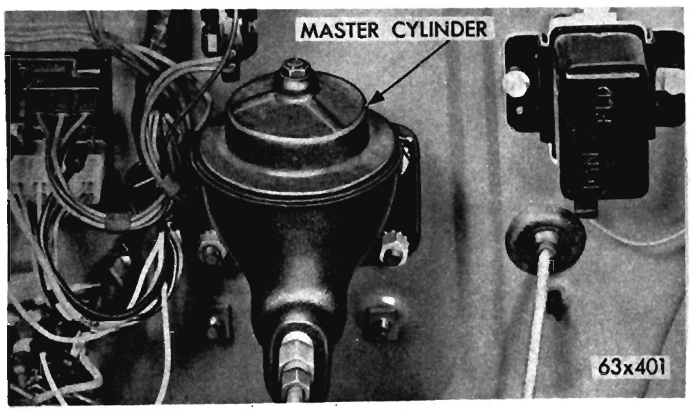


Fig. 15—Master Cylinder (6-Cyl.)

Hydraulic Brake System

Master Cylinder (Fig. 15)

Inspect the fluid level in the master cylinder every six months. Replenish with MoPar Hi-Temp Brake Fluid for the best performance. Bring the level up to within ¼ inch of the top of the reservoir.

Parking Brake Mechanism

The Valiant Models use a hand operated parking brake lever and the Plymouth Models continue with the foot operated lever (Figs. 16 and 17). When the foot lever can be depressed more than four and one-half inches or the hand lever pulled out more than four inches, refer to Group 5, "Brakes" for the adjusting procedures.

14. CHASSIS LUBRICATION

The front suspension ball joints should be inspected every 6 months or whenever the vehicle is serviced.

The ball joints are **semi-permanently** lubricated with a special lubricant at the factory. They should be relubricated every 32,000 miles with MoPar Multi-Mileage Lubricant, Part Number 2298947 (Figs. 18 and 19). Clean the accumulated dirt and grease from the outside surface of the seal to permit complete inspection. Remove the threaded plug from each ball joint. Insert a standard grease fitting, however, if high pressure dispensing equipment is used, care must be taken to fill and flush the ball joint slowly to avoid damaging the seal. If no grease fitting is used, an adapter will be necessary on the grease dispenser

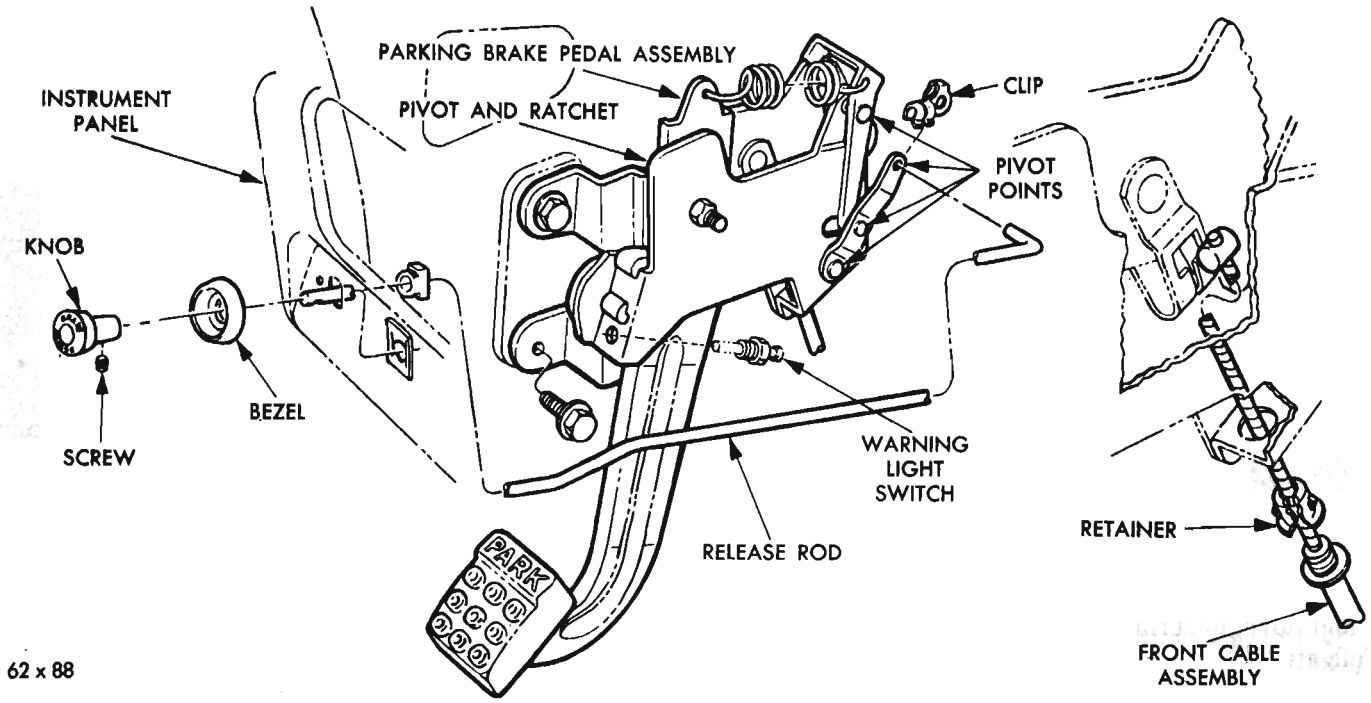


Fig. 16—Foot Operated Parking Brake (Disassembled) (Plymouth)

to ensure proper filling and flushing of the units. Stop filling when the lubricant begins to flow freely from the bleed areas at the base of the seal or if the seals begin to balloon. Reinstall the plugs.

Steering Linkage Ball Joints

The steering linkage ball joints should be inspected every 6 months or whenever the vehicle is serviced.

Damaged joints or seals should be replaced to pre-

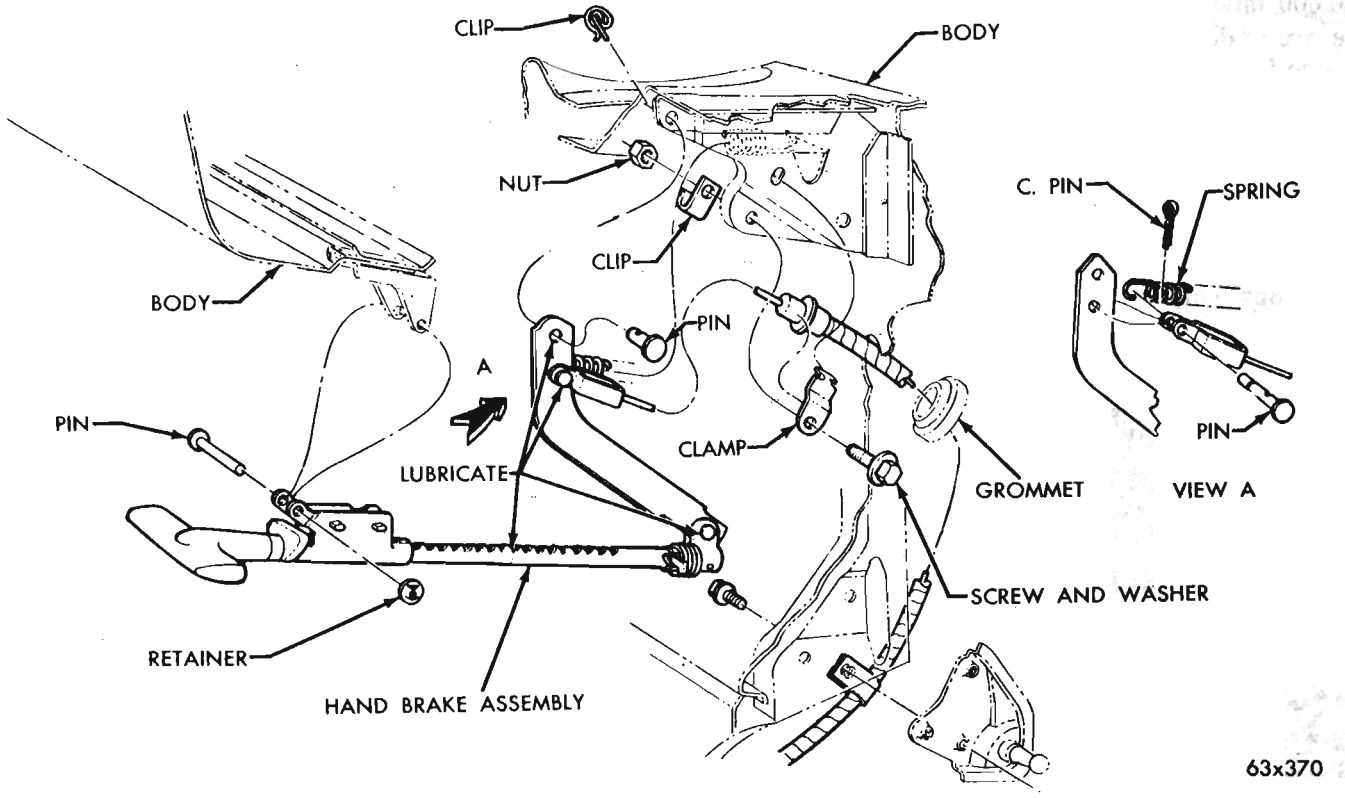


Fig. 17—Hand Operated Parking Brake (Disassembled) (Valiant)

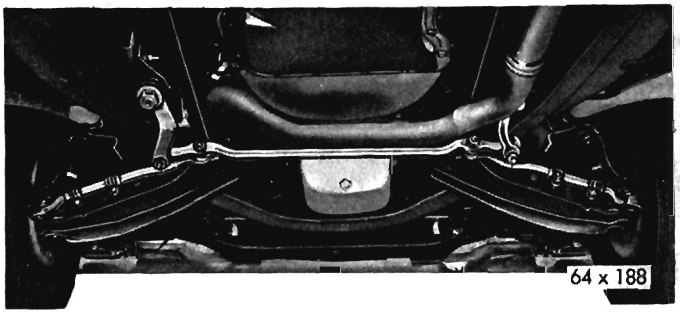


Fig. 18—Steering Linkage Location of Lubricating Fittings

vent contamination of the grease or failure of the component.

The tie rod and pitman arm linkage ball joints are **semi-permanently** lubricated with a special lubricant at the factory. All ball joints should be relubricated every 32,000 miles with MoPar Multi-Mileage Lubricant Part Number 2298947. Clean any accumulated dirt or grease from the outside surface of the seal to permit complete inspection. Remove the threaded plug from the ball joint. A standard grease fitting may be screwed into the hole. If not used, an adapter is necessary to correctly fill and flush the unit. MoPar Multi-Mileage lubricant should be injected into each unit until the grease flows freely from the seal bleed area, at the base of the seal. High pressure dispensing equipment may be used to flush and fill the unit. Re-install the plugs.

15. CLUTCH AND GEARSHIFT LINKAGES— (Manual Transmission)

Clutch Torque Shaft - Every 32,000 miles, relubricate the clutch torque shaft bearings on the clutch release fork, with MoPar Multi-Mileage Lubricant, Part Number 2298947 (Fig. 20).

Clutch Release Fork Swivel—When disassembling the clutch torque shaft, clean the swivel and swivel socket on the clutch release fork and lubricate with Automotive Multipurpose Grease, NLGI 2 at the time of reassembly.

Floor-Mounted Gearshift Lever (Valiant Only)

Whenever the operation of the lever indicates that lubrication is needed, remove the rubber boot from the floor panel and apply engine oil to the pivots, point and yoke selector mechanism.

Clutch Drive Lugs, Release Bearing Sleeve, Fork Fingers and Fork Pivots

If the effort required to depress the clutch pedal becomes excessive, the inspection plate on the bottom of the clutch housing and the fork boot should be removed to allow lubrication. Apply Automotive Multi-purpose Lubricant or MoPar Multi-Mileage Lubricant, Part number 2298947 to the points of contact and relative motion on the clutch drive lugs, fork fingers and fork points. Care must be taken to avoid application of lubricant to the clutch disc and pressure plate.

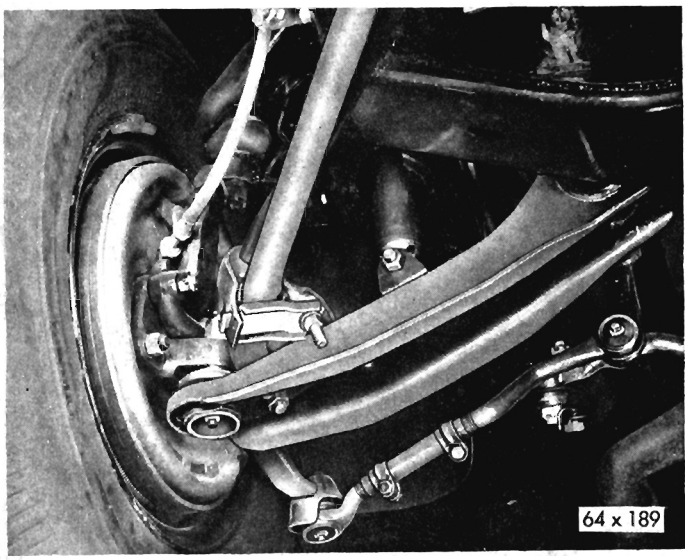


Fig. 19—Upper and Lower Ball Joints

16. COOLING SYSTEM

Inspect the level of the cooling system every 2 months. The cooling system should be drained, flushed and refilled with the proper coolant in the spring and again in the fall. When necessary to remove accumulations of rust and other deposits, maximum cleanliness can be restored by using Cooling System Cleaner according to the directions listed on the container. Always discard any old solutions removed. When ready for refilling refill with water and protect against corrosion by adding MoPar Rust Resistor, or refill with MoPar antifreeze and water, depending upon the season.

When draining the system both plugs on the V-8

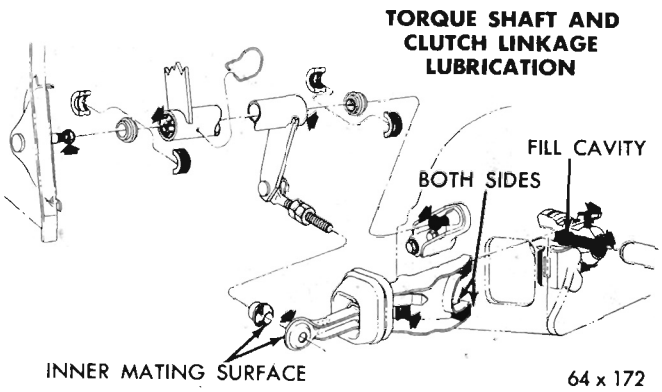


Fig. 20—Clutch Torque Shaft and Linkage



Fig. 21—Distributor Lubrication Points

engine or the single drain plug on the 6-cylinder engine should be opened, and the drain cock at the bottom of the radiator opened.

Sufficient permanent type antifreeze should be used in the cooling system at all times to prevent freezing in the heater core on vehicles equipped with air conditioning. The coolant solution must contain 20% glycol-type antifreeze during the summer months to provide for protection against temperatures down to +15°F. at the heater core. In the winter, protect for the lowest anticipated temperature range, but never use less than 20% glycol-type antifreeze to ensure adequate protection against corrosion.

All models are equipped with a 180° thermostat. With this thermostat, permanent type antifreeze **must** be used. Should an alcohol-type antifreeze be used, a 160° thermostat **must** be installed.

CAUTION: Chrysler Corporation does not recommend the use of a 160° thermostat for vehicles equipped with air conditioning.

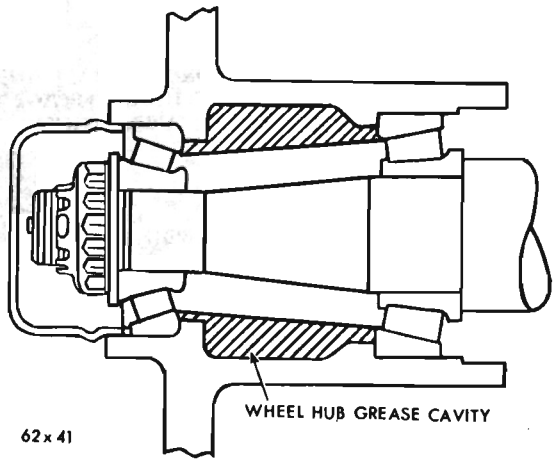


Fig. 22—Wheel Bearing (Schematic)

17. DISTRIBUTORS

Every 10,000 miles or once each year apply three drops of light engine oil to the felt rotor wick (Fig. 21). Apply 5 to 10 drops of light engine oil in the oil cup. Apply MoPar Cam Lubricant to the cam and rubbing block.

Two or three drops of light engine oil in the felt wick are required. Apply a thin coat of MoPar Cam Lubricant on the cam and rubbing block after the old lubricant has been wiped off.

18. FRONT WHEEL BEARINGS

The front wheel bearings should be cleaned and repacked with Wheel Bearing or Automotive Multi-purpose Lubricating grease whenever the brake linings are replaced or the brake drums are resurfaced.

The lubricant in the wheel bearings should be inspected whenever the wheels are removed to inspect or service the brake system. Do not repack the bearings if the grease is adequate in quantity and in good condition.

If the lubricant is low in quantity, contains dirt, or has been contaminated with water to produce a milky appearance, the old lubricant should be removed, the bearings cleaned and relubricated with Wheel Bearing Lubricant, or Multi-purpose Lubricating grease. DO NOT ADD LUBRICANT TO THE WHEEL BEARINGS.

Clean out the old lubricant thoroughly from the bearings and the hubs and repack with the new lubricant. The annular groove of the wheel inner hubs should be filled with lubricant (Fig. 22).

To adjust the front wheel bearings.

(1) Tighten the wheel bearing adjusting nut to 70 inch-pounds on Valiant Models and 90 inch-pounds torque on Plymouth Models while rotating the wheel.

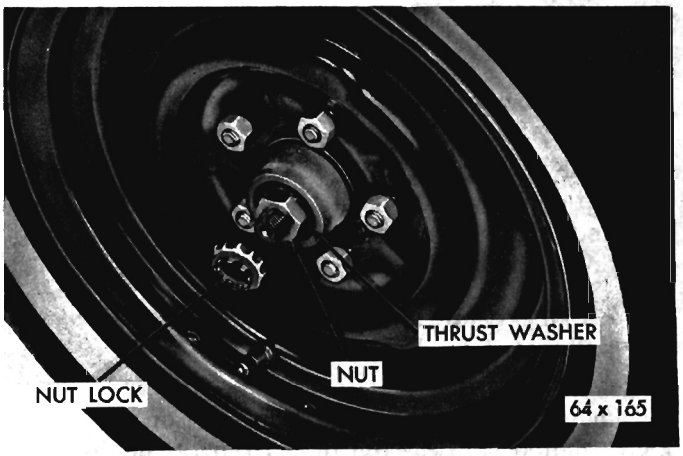


Fig. 23—Front Wheel Bearing Installation

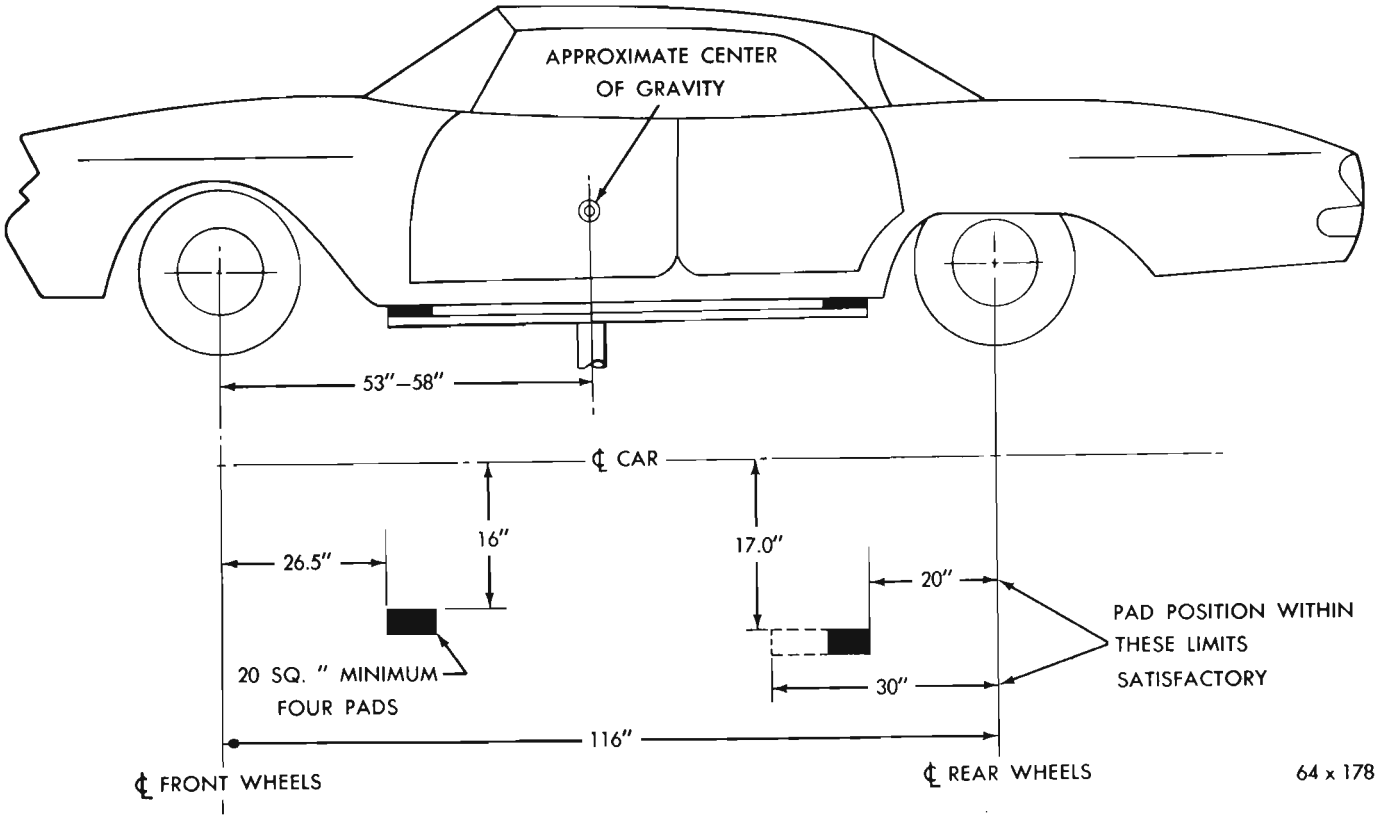


Fig. 24—Support Location for Frame Contact Hoisting (Plymouth)

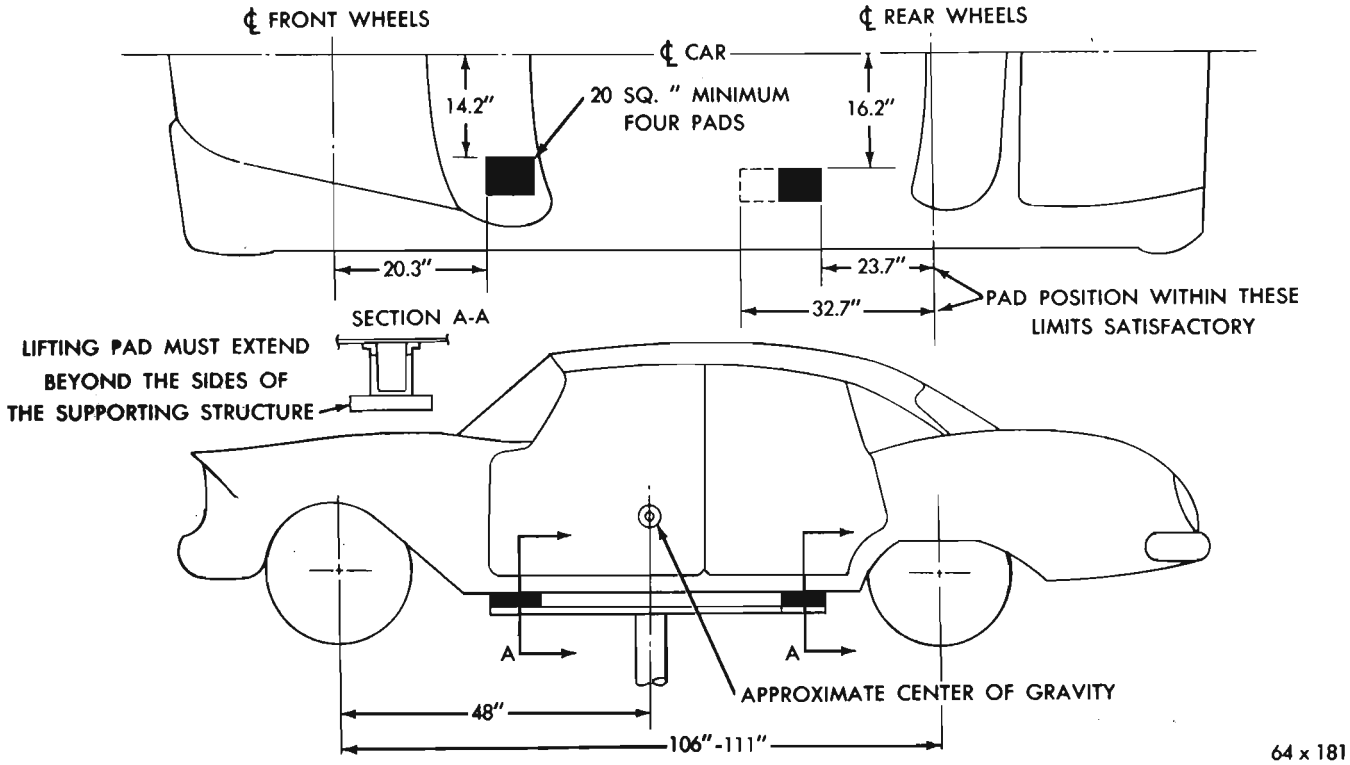


Fig. 25—Support Location for Frame Contact Hoisting (Valiant)

(2) Position the nut lock on the adjusting nut so one pair of the cotterpin slots aligns with the hole in the spindle (Fig. 23).

(3) Back off the adjusting nut and lock assembly to the next slot, and install the cotter pin.

(4) Clean the lubricant cap, coat the inside with wheel bearing lubricant (do not fill) and install the cap.

(5) Install the wheel, tighten the wheel nuts to 65 foot-pounds torque and install the wheel cover.

19. HEADLAMPS

One of the most important contributions to automotive safety, is the correct adjustment of the headlamp beams. Suspension geometry changes, or heavy loading often will change the headlamp beam pattern and cause unsafe driving conditions. If a vehicle is to be loaded abnormally, such as on a vacation trip, or a salesman's vehicle loaded with his products, the headlamps should be adjusted. Refer to "Electrical" Group 8 for service procedures.

20. HOISTING

Special care should be taken when raising the vehicle on a frame contact type hoist. The hoist must be equipped with the proper adapters in order that the vehicle will be supported in the correct location, as shown in Figures 24 and 25.

Conventional hydraulic hoists may be used after determining that the adapter plates will make firm contact with the lower control arms and the rear axle housing.

A regular floor jack may be used under the rear axle housing, or under the front suspension lower control arms, however, a floor jack must never be used on any other parts of the underbody.

CAUTION: Do not attempt to raise one entire side of the vehicle by placing a jack midway between a front and rear wheel. This procedure may result in permanent damage to the body.

The bumpers are designed to accept a bumper jack in an emergency, if it becomes necessary to change a tire on the road. Notches are provided in the bumpers for the purpose of raising the vehicle with the bumper jack.

21. PARTS REQUIRING NO LUBRICATION

There are many points that should not be lubricated, some because they are permanently lubricated, some because lubricants will be detrimental to their operating characteristics, and some because lubricants will cause component failures. In any event, rubber bushings should not be lubricated, not only because lubricants will cause rubber to fail, but also will destroy their necessary friction characteristics. The following parts should not be lubricated:

Accelerator Pedal
All Rubber Bushings
Alternator Bearings
Brake Linkages (Passenger side of Dash Panel)
Carburetor Air Cleaner
Clutch Pedal Push Rod Ends
Clutch Release Bearings
Drive Belts
Fan Belt Idler Pulley (With Air Conditioning)
Rear Springs
Rear Wheel Bearings
Starter Bearing
Steering Gear Arm Pivot
Upper and Lower Control Arm Bushings

22. PROPELLER SHAFTS AND UNIVERSAL JOINTS

Every 6 months inspect for external leakage. The universal joints should not be disassembled or relubricated unless external leakage is noted.

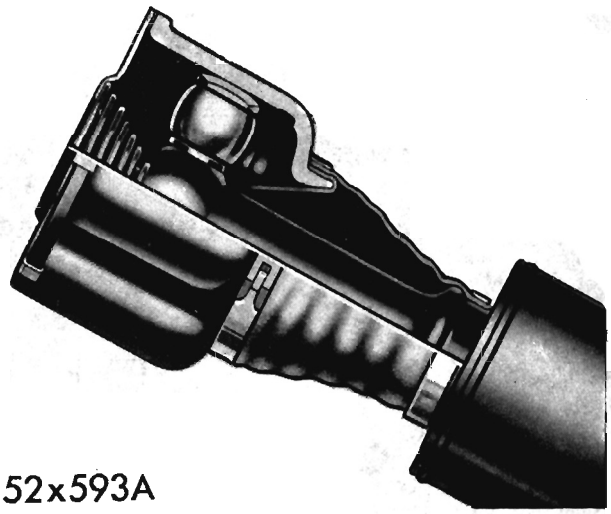


Fig. 26—Universal Joint Ball and Trunnion

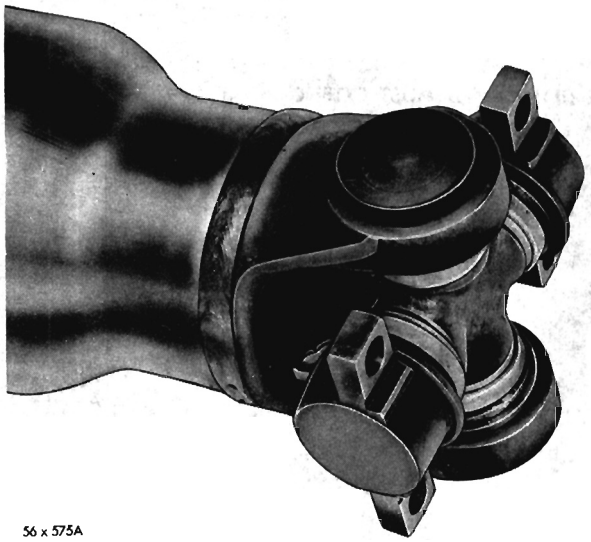


Fig. 27—Universal Joint Cross and Roller

Relubrication of the universal joint is not required for normal vehicle usage. If the vehicle operation is similar to any of the following, it is recommended that the universal joints be disassembled, cleaned, and relubricated every 32,000 miles (Figs. 26 and 27).

1. Police vehicles.
2. Taxicab operation.
3. Frequent towing of trailers.
4. Continuous operation at higher than normal loading.

The universal joints should be relubricated with MoPar Multi-Mileage Lubricant, Part No. 2298947 as follows:

1. Ball and Trunnion - Repack with two (2) ounces lubricant.
2. Cross and Roller - Repack.

23. REAR AXLE AND SURE GRIP

Multipurpose Gear Lubricant as defined by MIL-L-2105B should be used in all rear axles. MoPar Hypoid Lubricant Part Number 1879414 is also used for all rear axles.

Frequency of Oil Change

The changing of all rear axle lubricant is not recommended for vehicles used in normal service, except when the axle oil has been contaminated with water or to provide the correct viscosity grade for the anticipated temperature range as indicated by the following table:

Anticipated Temperature Range	Viscosity Grade
Above —10°F.	SAE 90
As low as —30°F.	SAE 80
Below —30°F.	SAE 75

The lubricant level should be inspected every 6 months with the vehicle in a level position. The oil level should be as follows:

Plymouth (All Models)	The vehicle supported on a wheel or axle type hoist.	The lubricant level should be between the bottom of the filler plug hole to ½ inch below. (Fig. 28).
Valiant (All Models)	The vehicle supported on a wheel or axle type hoist—or The vehicle supported on a frame type hoist.	The lubricant level should be between the botom of the filler plug hole to ⅝ inch below or— The lubricant level should be at the bottom of the filler plug hole. (Fig. 29).



Fig. 28—Removing Lubricant with a Suction Tube (8-Cyl.)

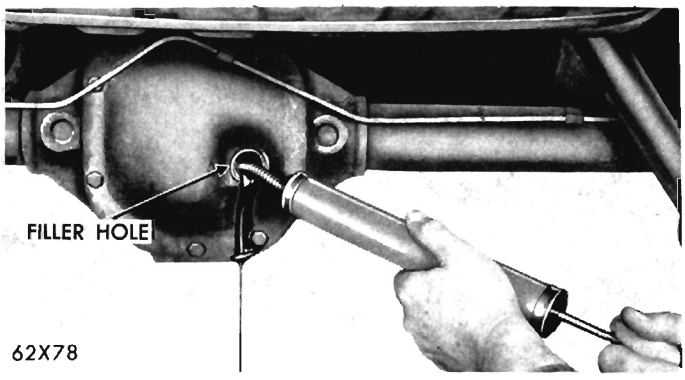


Fig. 29—Removing Lubricant with a Suction Tube (6-Cyl.)

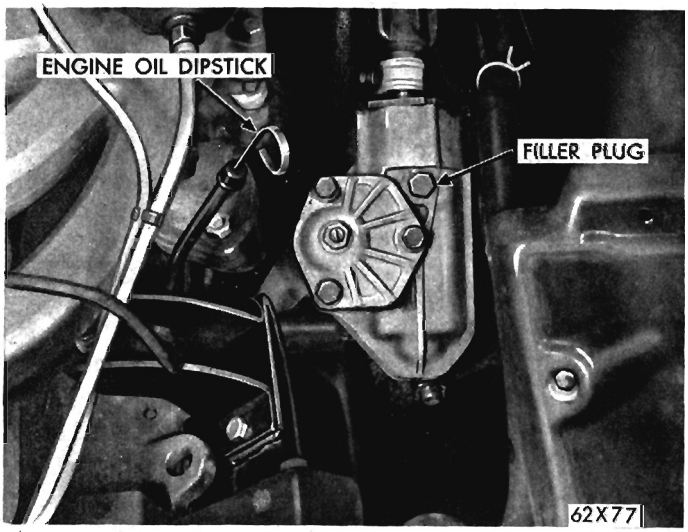


Fig. 30—Manual Steering Gear Lubrication

24. SPEEDOMETER CABLE

The speedometer cable should be removed, cleaned and relubricated with MoPar All-Weather Speedometer Lubricant, Part Number 1243632 if the operation becomes noisy or erratic.

Disconnect the cable at the speedometer housing, and remove the shaft. Clean the shaft and coat with a very thin film of lubricant and reinstall the shaft. Clean the excess lubricant from the top one-foot of core and from the ferrule before the shaft is inserted completely.

CAUTION: Excessive lubricant may cause speedometer malfunction.

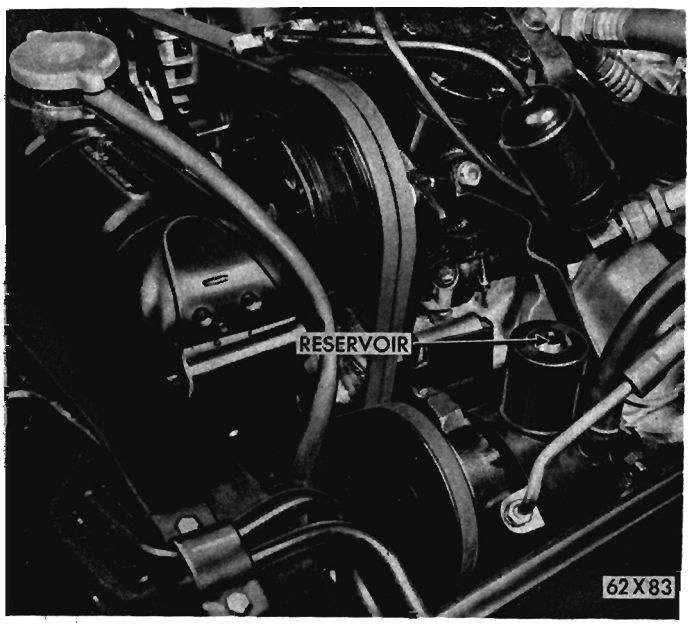


Fig. 31—Power Steering Reservoir

25. STEERING

Manual Steering

Every 6 months the lubricant level of the fluid should be checked and if necessary replenish to the level of the filler hole with Multipurpose Gear Lubricant as defined by MIL-2105B. Use SAE 80 for temperatures ranging above —30°F. and SAE 75° for temperatures below —30°F. If SAE 80 is not available SAE 90 may be used (Fig. 30).

CAUTION: Do not use a pressure gun.

Power Steering

Inspect the level of the power steering pump reservoir every six months (Fig. 31). If necessary, replenish to the bottom of the filler neck, with MoPar Power Steering Fluid, Part Number 2084329.

26. TIRES

Tires should be rotated including the spare (Fig. 32) every 5,000 miles to provide long tire life, uniform wear, and to retain confortable riding qualities.

The spare should be used so that all the tires will wear at approximately the same rate.

The tires should be examined for unusual wear patterns, foreign material and proper inflation pressure, each time the engine oil is changed. Such conditions, may reflect unusual driving habits or indicate mechanical corrections may be necessary.

See the capacities page for the recommended inflation pressures.

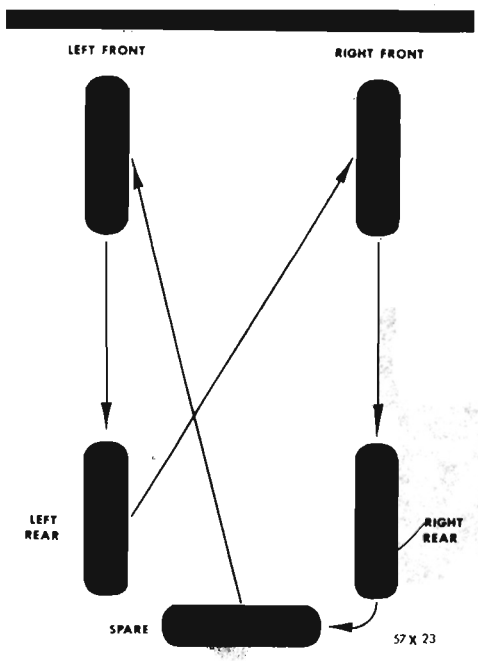


Fig. 32—Tire Rotation

27. TRANSMISSION

Manual Transmission

Every 6 months, remove the filler plug and inspect the fluid level, and if necessary replenish to the level of the filler hole. Use Automatic Transmission Fluid, Type "A", Suffix "A" for 3-speed and 4-speed manual transmissions for all anticipated temperature ranges. Multipurpose Gear Lubricant SAE 90 or SAE 140 may be used in warm climates. Use Multipurpose Gear Lubricant SAE 80 with the 3-speed Warner T-85 heavy duty manual transmission for temperatures ranging above + 32°F. SAE 90 may be used if SAE 80 is not available. Automatic Transmission Fluid Type "A", Suffix "A" should be used when the temperature drops below + 32°F.

Frequency of oil change—No change is recommended for vehicles used in normal service.

Trailer Towing Service

Drive line components on passenger vehicles used to pull trailers or similar heavy duty usage will require more frequent inspection and service than those used in normal passenger vehicles. See "Passenger Car Special Towing Recommendations".

Automatic Transmission

Inspect the fluid level every 6 months with the engine and transmission at normal operating temperature.

(1) With the parking brake on and the engine idling, depress each button momentarily, ending with the "N" (Neutral) button pushed in.

(2) The fluid level should be slightly below the full mark, but never above the "F" mark when the engine is at its normal warmed condition described above. Add or remove the fluid as necessary to bring to this level.

CAUTION: To prevent dirt from entering the transmission make certain that the dip stick cap is reseated properly onto the filler tube.

If it is necessary to inspect the fluid level when the transmission is cold, the fluid should be at, or slightly below the "Add One Pint" mark. If below the mark, add one pint of fluid then recheck the level.

Chrysler Corporation does not recommend the addition of any fluids to the transmission other than Automatic Transmission Fluid, Type "A" Suffix "A". The only exception to this policy are the uses of refined kerosene to aid starting in very cold weather, the use of special dyes to aid in detecting fluid leaks and the use of MoPar Automatic Transmission Sealer, Part Number 2298923, in high mileage vehicles. If starting is difficult when the average temperature consistently ranges below —10°F., drain 1½ pints of transmission fluid and replace with refined kerosene. **This service should be performed only once during the low-temperature season.** Thereafter, any replenishment should be with Automatic Transmission Fluid, Type "A", Suffix "A".

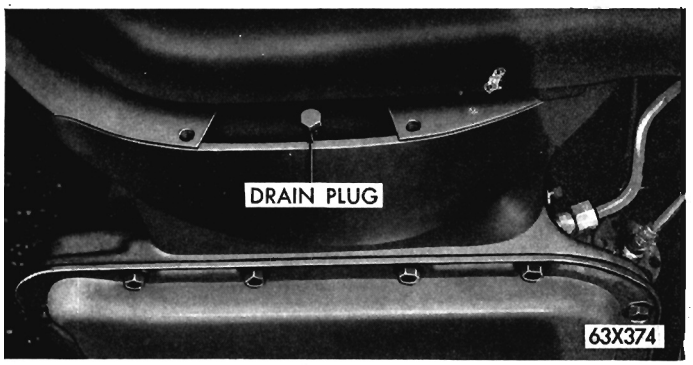


Fig. 33—Converter Drain Plug

Frequency of Lubrication

The transmission fluid and oil filter will provide satisfactory lubrication and protection to the automatic transmission, therefore regularly scheduled oil changes will not be required in vehicles used in normal service. Therefore, the oil changes will not be required except when the service is severe as described below. If the regular operation of the vehicle is similar to any of the following, the transmission should be adjusted and the oil and filter changed approximately every 32,000 miles.

1. Police vehicles.
2. Taxicab operation.
3. Frequent towing of trailers.
4. Continuous operation at higher than normal loading.

For extreme severe service, it may be necessary to change the fluid more frequently (Fig. 33).

Refer to Group 21, "Transmission" for the oil change procedure.

28. WINDSHIELD WIPERS

If the windshield wipers are smearing or in general poor wiping of the windshields, the rubber blade should be replaced with a new one.

Depress the release on the top of the blade and the rubber blade will slide off. Replace with the new rubber blade. Slide the bade into the catch to fasten. Refer to MoPar Parts list for the correct blade.

HOOD LATCH (Lock Stricker Plate) (All Models)

Lubrication of the Hood lock assembly is of vital importance to prevent any possibility of a binding or frozen lock or safety latch.

Every 6 months apply Automotive Multi-purpose lubricant to all pivot points, springs and rubbing surfaces. Work the lubricant in the latch mechanism until all functional areas are covered.

PASSENGER CAR MAINTENANCE SCHEDULE FOR CERTIFIED CAR CARE

	Maintenance	Service and/or Certification Interval									
		6 Mos.	12 Mos.	18 Mos.	24 Mos.	30 Mos.	36 Mos.	42 Mos.	48 Mos.	54 Mos.	60 Mos.
DEALER CERTIFICATION REQUIRED	Change engine oil—every 2 months, not to exceed 4,000 miles	X	X	X	X	X	X	X	X	X	X
	Change engine oil filter—every 6 months	X	X	X	X	X	X	X	X	X	X
	Clean and inspect carburetor air filter—every 6 months not to exceed 8,000 miles	X	X	X		X	X	X		X	X
	Replace carburetor air filter—every 2 years, not to exceed 32,000 miles				X				X		
	Inspect fluid level—transmission and rear axle	X	X	X	X	X	X	X	X	X	X
	Inspect and lubricate manifold heat control valve	X	X	X	X	X	X	X	X	X	X
	Inspect universal joint seals	X	X	X	X	X	X	X	X	X	X
	Clean oil filler cap and inspect crankcase ventilator valve	X		X		X		X		X	
	Clean oil filler cap and replace crankcase ventilator valve		X		X		X		X		X
	Cooling system—flush and refill		X		X		X		X		X
RECOMMENDED SERVICES	Inspect fluid level in steering gear and brake master cylinder reservoir	X	X	X	X	X	X	X	X	X	X
	Inspect seals at suspension ball-joints and all steering linkage pivots	X	X	X	X	X	X	X	X	X	X
	Lubricate body mechanisms (door hinges and latches, hood and trunk latches, etc.)	X	X	X	X	X	X	X	X	X	X
	Lubricate choke linkage and shaft	X	X	X	X	X	X	X	X	X	X

RECOMMENDED SERVICES AT MILEAGE INTERVALS

Rotate tires—inspect for wear	Every 5,000 miles
Engine performance evaluation and tune-up, if necessary	Every 10,000 miles or once each year
Inspect front brake assemblies and front wheel bearings	Every 20,000 miles or every two years
Replace fuel filter	Every 16,000 miles or once each year
Lubricate front suspension ball-joints, tie-rod ends and clutch torque shaft (Manual transmission)	Every 32,000 miles

PASSENGER CAR TRAILER-TOWING SERVICE RECOMMENDATIONS

TRAILER TOWING SERVICE—The drive line components on passenger vehicles used to pull trailers or similar heavy duty usage will require more frequent inspection and service than those used in normal operation. The recommended service intervals are as follows:

MODEL	Normal recommended service interval	Lt. duty—occasional trailer-towing	Med. duty—frequent trailer-towing	Hvy. duty—continuous or prolonged trailer-towing
Valiant—Combined weight limits (trailer & load)		Up to 1500 lbs.	Up to 1500 lbs.	1500 to 3500 lbs.
Plymouth—Combined weight limits (trailer & load)		Up to 2000 lbs.	Up to 2000 lbs.	2000 to 4500 lbs.
Maintenance				
Change transmission fluid	(Not required)	32,000 miles	32,000 miles	10,000 miles
Replace transmission oil filter (Auto. trans.)	(Not required)	32,000 miles	32,000 miles	10,000 miles
*Change rear axle lubricant	(Not required)	32,000 miles	32,000 miles	32,000 miles
Inspect universal joints and fluid level in transmission and rear axle. (Imp. only—inspect center prop. shaft bearing & mount)	Every 6 months	Every 6 months	Every 2 months, not to exceed 4,000 miles	Every 2 months, not to exceed 4,000 miles
Inspect front brake assemblies and front wheel bearings	20,000 miles	20,000 miles	20,000 miles	10,000 miles

*Contamination of the rear axle lubricant with water is possible by submerging the rear axle in water, allowing water to enter the axle vent. Boat-launching ramps are sometimes located to permit the submersion of the car axle. **If contamination by water is evident or suspected, rear axle lubricant must be changed immediately, or axle failure will result.**

CERTIFIED CAR CARE—ENGINE PERFORMANCE EVALUATION EVERY 10,000 MILES OR ONCE EACH YEAR

1. **Spark Plugs** usually can be cleaned, adjusted and re-used for 20,000 miles. They should be replaced whenever obvious physical deterioration is apparent or when a test indicates sub-standard performance.

2. **Distributor**—Remove the distributor cap and rotor, clean and inspect. Inspect the ignition braker points for pitting, bluing, and misalignment and adjust (lubricate cam and wick). Assure that all distributor secondary wires and tower caps are clean and seated properly at all connections. Set ignition timing to proper factory specifications. Refer to Group 8, "Electrical" for service procedures.

3. **Carburetor**—Remove the air cleaner filter and clean properly. Check the fast idle speed at cam index. Adjust the carburetor idle mixture and fast idle speed to proper settings. Tighten the carburetor air horn to manifold nuts, also, inspect the crankcase ventilator valve. Be assured that the manifold heat control valve and the carburetor choke linkage and shaft are operating properly and are each re-treated with their specified solvent.

4. **Electrical**—Inspect the battery specific gravity. Clean and tighten the battery terminals and connections. Test the battery line voltage at the starter. Test the starter cranking ability.

CERTIFIED CAR CARE—SEMI-ANNUAL MAINTENANCE SERVICE

Replace—Engine Oil Filter element.

Lubricate—Manifold Heat Control Valve with special MoPar solvent, carburetor choke shaft and throttle linkage.

Wipe clean and Lubricate, if necessary—Door Hinges and other Hard-to-lubricate places, Door Latch Rotor, Door Lock Striker Plates, Door Check Arms, Hood Hinges and Lock, All External Lock Cylinders, Parking Brake Mechanism, (foot and hand operated), License Plate Mounting Panel Springs and Pin, Deck Lid Latch, Accelerator Shaft Sound Insulator (located on throttle shaft), Ball Joint at top of Accelerator Pedal Rod (passenger side of firewall), Plastic Bushing on Throttle Linkage (passenger side of firewall), Throttle Control Bellcrank (passenger side of firewall), Engine Exhaust Manifold Mounted Bellcrank, All Station Wagons as noted: Tail Gate Hinges, Tail Gate Locks, Tail Gate Lock Striker Plates and Dovetail Surfaces, Tail gate Torsion Bar and Support Arm Guide Pillars.

Check Levels and Add Fluids, if Necessary—Transmission - (conventional or automatic), Rear Axle Differential, Steering Gear Pump (Power Steering), Manual Steering Gear, Engine Coolant - Check Antifreeze Brake Master Cylinder, Battery.

Inspect—Condition of ball joints and steering linkage pivot and the ventilator valve.

CERTIFIED CAR CARE—BRAKE SYSTEM MAINTENANCE SERVICE EVERY 20,000 MILES OR EVERY TWO YEARS

1. Remove both front wheel, tire and drum assemblies.

NOTE: Front brakes do 60% of the braking. The condition of the front brakes will serve as an indicator of the condition of the rear brakes.

(2) Blow out any accumulated dust or dirt.

(3) Inspect lining wear pattern and determine remaining lining life.

(4) Inspect condition of shoe return springs, inspect freedom of shoe movement, wheel cylinders, dust boots and backing plates.

(5) Inspect the brake drums for excessive out of round, score marks, hard spots, and spider webbing.

(6) Safety inspect all brake lines, brake tees and hoses. Safety check all conditions. Inspect the lower outside portion of the rear brake backing plates, leakage inside will usually show at this point.

(7) Fill master cylinder reservoir to the proper level.

(8) Adjust service brakes, on Models without automatic brake adjusters.

(9) Inspect and, if necessary, adjust the parking brake.

CERTIFIED CAR CARE—FRONT SUSPENSION ALIGNMENT

(1) Determine if vehicle needs the front suspension system aligned. Three important reasons can indicate this need:

a. Tire wear pattern
and or
b. Car pulls in one direction on brake application
and or
c. Car leads, left or right, in normal driving.

2. Inflate all tires to the same pressure.

(3) Inspect, if necessary, adjust front suspension height at torsion bars.

(4) Inspect, if necessary, adjust camber, caster, and toe-in.

(5) Inspect the condition of the steering linkage and inspect the seal condition of suspension parts.

(6) Inspect the steering gear lubricant level.

(7) Aim all headlamps.

GROUP 1

ACCESSORIES (RADIOS, HEATERS, MIRRORS)

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HOT WATER HEATER (VALIANT)

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RADIO AND ANTENNA

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WINDSHIELD WASHER

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ACCESSORIES (RADIOS, HEATERS, MIRRORS)

A disc type, solenoid actuated, self regulated electric clock is available as additional equipment on the Plymouth Models.

ELECTRIC CLOCK

SERVICE PROCEDURES

1. CLOCK

Removal

(1) Disconnect the battery ground cable.

(2) Remove the instrument cluster from the instrument panel. See "Electrical" Group 8 - Instruments.

(3) Remove the clock reset knob.

(4) Disconnect the wiring from the clock.

(5) Remove the two screws that attach the clock to the instrument cluster and carefully remove the clock.

Installation

(1) Install the clock into the instrument cluster and install the two attaching screws.

(2) Connect the wiring to the clock.

(3) Install the clock reset knob.

(4) Install the instrument cluster.

(5) Connect the battery ground cable.

HOT WATER HEATER-PLYMOUTH

The hot water heating system, shown in Figure 1, incorporates forced air ventilation. Forced air ventilation is accomplished by the use of an axial flow blower which provides ventilation irrespective of vehicle speed. The speed of the blower is controlled by a three speed switch.

The Temperature Control Lever—Operates the water valve through a bowden cable. It is important that the bowden cable be adjusted to provide full opening and closing of the water valve for efficient functioning of the system.

Summer Ventilation—is controlled by the opening of the ventilator air damper.

Heating—air enters through the cowl air intake, passes through the heater core into the blower and distribution duct through the opened shut-off damper.

Defrosting—is controlled by the defroster damper. For maximum defrosting or deicing the temperature control lever must be set in the full warm position.

Temperature Control Lever—selects the temperature of the air discharged through the lower and upper outlets. When the lever is to the top, air is not being heated. Air temperature is increased by moving the lever toward "**WARM**" down position.

Off Button—When the "**OFF**" button is pushed in, the system will not operate. The **OFF** button cuts

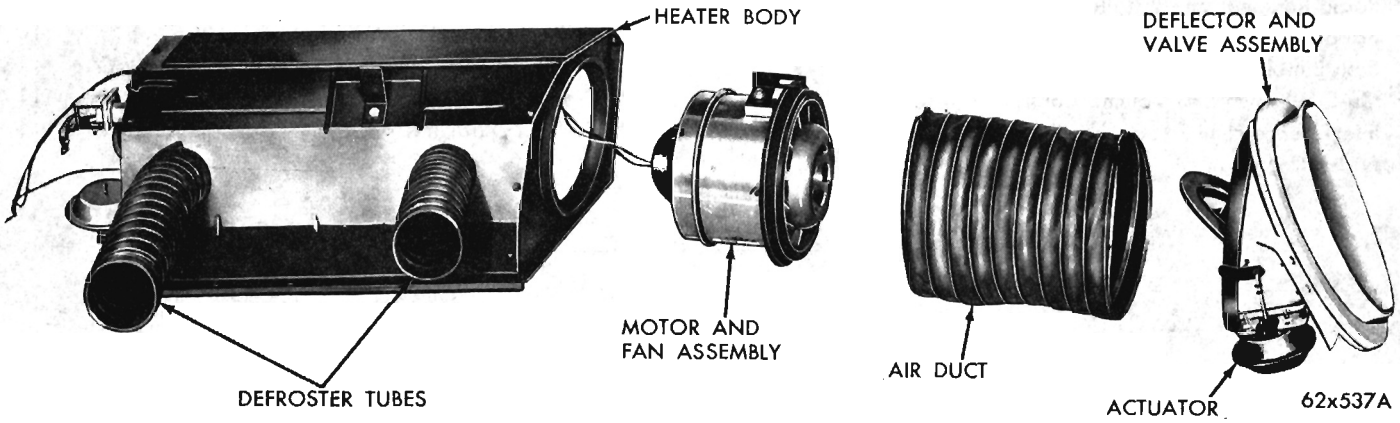


Fig. 1—Push Button Heater (Plymouth)

off the current from the control lever switch. The ventilation doors are closed, preventing outside air from entering the vehicle.

Cool button—opens the ventilation door to allow outside air to enter the vehicle directly.

Defrost Button—causes a major portion of the air to be forced against the windshield through air outlets on top of instrument panel for defrosting or defogging.

Heat Button—causes major portion of air to be directed toward the floor of the vehicle.

Heating the Vehicle

Until the engine warms up, make sure the "**OFF**" button is pushed in and the temperature control lever is in the "**WARM**" position. Then, push in the "Heat" button and leave the temperature control lever in the "**WARM**" position. After warm-up, the "**LO**" button can be used and the temperature control lever adjusted to maintain the desired temperature. At lower outside temperatures and particularly to obtain maximum rear seat heating performance, it may be necessary to use the "**HI**" button to provide maximum air circulation. It is important to keep the windows closed, particularly the front vent wings, to eliminate objectional drafts and permit maximum air flow to the rear of the vehicle. **When the heat button is pushed in, sufficient warm air will be forced onto the windshield through the upper air outlets for adequate defogging during average driving conditions.**

Defrosting or Defogging the Windshield

Push in the "Defrost" button for maximum defrosting, move the temperature control lever to the "**WARM**" position. Under particularly severe fogging conditions, opening the front vent wings temporarily, will speed up the removal of fog from the windows.

Summer Ventilation

Push in the "COOL" button to open the ventilation door. Move the temperature control lever to the extreme up position. The ventilation door may be left open during rain.

Rear Window Defroster (If so Equipped)

A toggle switch (at left and under the instrument panel) operates a blower which circulates air over the rear window to prevent fogging.

SERVICE PROCEDURES

1. HEATER BLOWER

Removal

(1) Disconnect the battery ground cable.

(2) Disconnect the heater ground wire.

(3) Loosen the fresh air intake duct clamp (at the blower end) and remove the duct from the blower assembly.

(4) Remove the screw attaching the blower to the plenum.

(5) Remove the heater blower assembly from the heater housing.

(6) From inside the heater housing, disconnect the blower assembly wires.

Installation

(1) Connect the heater blower wires to their connectors inside the heater housing.

(2) Position the blower assembly in the rubber grommet in the heater housing with the blower mounting bracket positioned against the plenum bracket and install the mounting bracket screw.

(3) Install the fresh air duct on the heater blower assembly and tighten the clamp.

(4) Connect the heater ground wire.

(5) Connect the battery ground cable.

(6) Test the operation of the heater blower.

2. HEATER VACUUM ACTUATOR

(1) To remove, disconnect the vacuum hoses.

(2) Remove the two nuts and lockwashers attaching

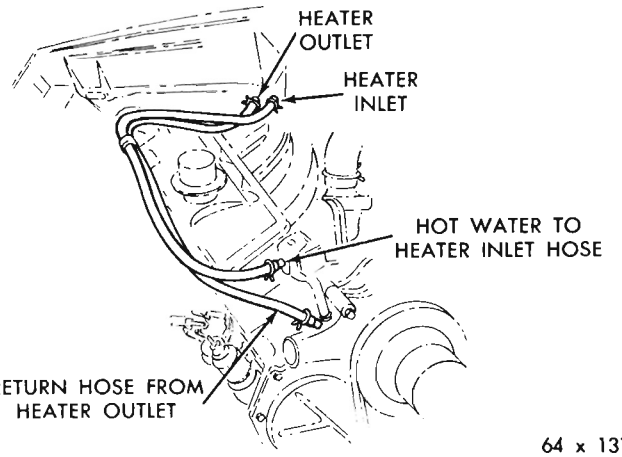


Fig. 2—Heater Hose Connections—170 and 225 Cu. In. Engines

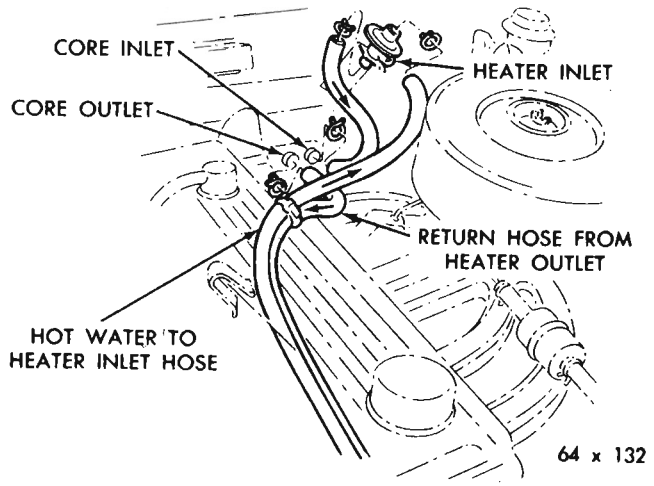


Fig. 3—Heater Hose Connection with Air Condition—170 and 225 Cu. In. Engines

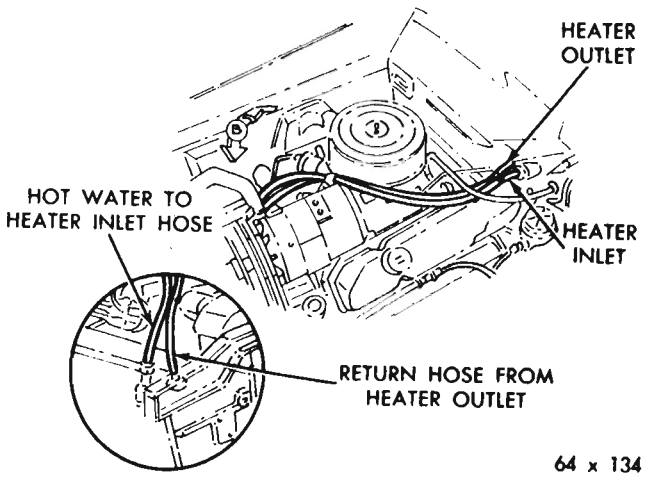


Fig. 5—Heater Hose Connections—All 8-Cylinder Engines Except 318 Cu. In. Engine

the vacuum unit to the housing, and the one clip attaching the vacuum unit rod to the actuated unit.

3. HEATER CORE

Removal (Figs. 2, 3, 4, 5 and 6)

(1) Disconnect the battery ground strap.

(2) Drain the cooling system.

(3) Disconnect the heater hoses at the heater.

(4) Remove the fresh air intake duct from the blower assembly.

(5) Remove the blower to plenum bracket screw.

(6) Disconnect the actuator lines.

(7) Disconnect the heater wires receptacle from the heater (left side).

(8) Disconnect the heater ground wire.

(9) Remove the control lever cable from the heater control valve.

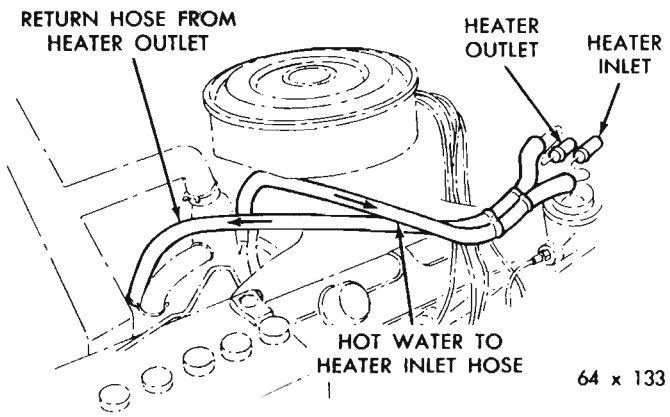


Fig. 4—Heater Hose Connections—318 Cu. In. Engine

(10) Remove the defroster tubes from the heater housing.

(11) From the engine compartment remove the three nuts and washers attaching the heater assembly to the dash panel.

(12) Remove the heater to dash panel attaching screws.

(13) Remove the heater assembly.

(14) Remove the heater control valve screws and remove the valve by pulling the valve straight out from the housing. The valve is held into the heater core by the use of an "O" ring only.

(15) Remove the screws attaching the heater housing to the heater core and remove the heater core assembly.

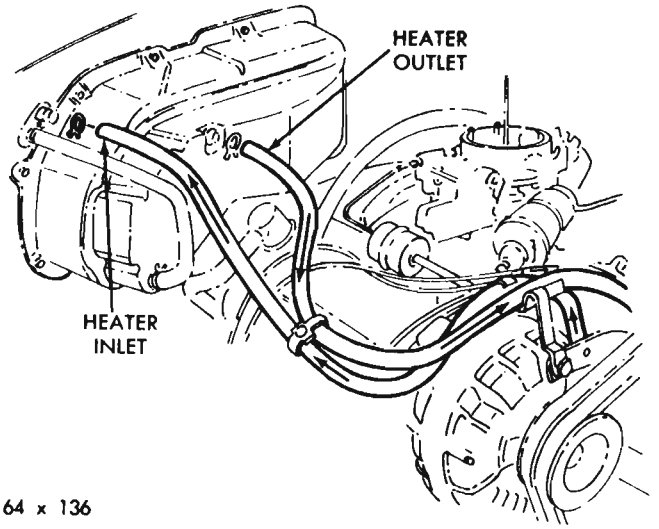


Fig. 6—Heater Hose Connections with Air Conditioning —All 8 Cylinder Engines

Installation

(1) Position the heater core in the heater housing and install the attaching screws.

(2) Position the heater control valve into the heater core and install the two screws attaching the valve to the heater housing.

(3) Position the heater assembly on the dash panel and install the heater bracket to dash panel attaching screws.

(4) From the engine compartment, install the three nuts and washers attaching the heater to the dash panel.

(5) Install the heater hoses and fill the cooling system. Make certain the hoses are connected correctly (See Figures 2, 3, 4, 5 and 6).

(6) Install the defroster tubes.

(7) Connect the intake air duct to the heater blower assembly.

(8) Install the heater blower bracket to plenum bracket screw.

(9) Connect the heater control lever cable to the heater control valve.

(10) Connect the heater wire receptacle to the heater assembly.

(11) Connect the heater ground wire.

(12) Connect the actuator lines to the actuators.

(13) Connect the battery ground cable.

(14) Start the engine and operate the heater.

(15) Inspect for water leaks.

4. REAR WINDOW DEFROSTER

The rear window defroster (optional on all models) is located on and under the rear shelf panel of the vehicle, and consists of a blower, flexible hose and nozzle. A switch, located on the instrument panel, controls the blower for defrosting the rear window. The rear window defroster operates independently from the heater. The air forced against the rear window glass is drawn by the defroster blower from the air inside the vehicle.

HOT WATER HEATER-VALIANT

The heater assembly (Fig. 7) used on Valiant models incorporates a "Ram-Air" feature. The heater controls (Fig. 8) are located in the instrument panel directly above the radio opening. Two fresh air ducts (Figs. 9 and 10), for warm weather use, are located at each end of the instrument panel. A two speed motor is used in conjunction with the heater. The "Temp" control knob controls the amount of heat desired. The "Def" knob controls the air flow to the windshield for defrosting. Two manually operated fresh air ducts are provided.

SERVICE PROCEDURES

1. HEATER ASSEMBLY

Removal

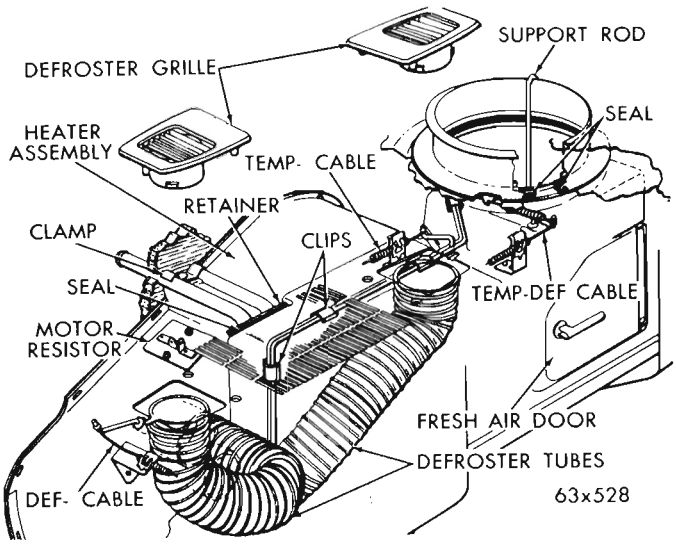


Fig. 7—Heater Assembly (Valiant)

(2) Disconnect the heater hoses from the heater and remove the heater hoses to dash panel seal and retainer plate (Figs. 11 and 12).

(3) Disconnect the wires from the heater motor.

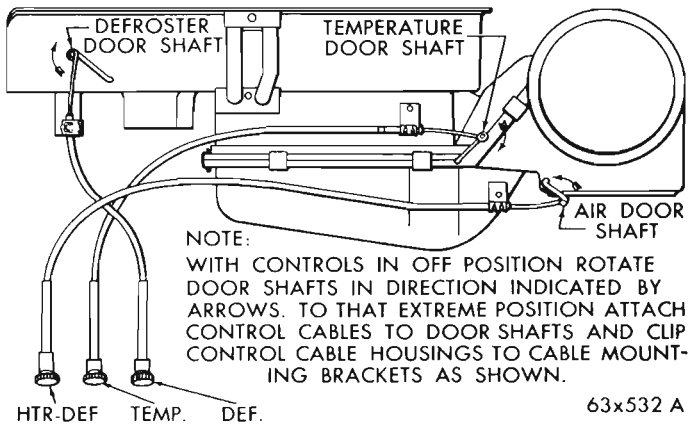


Fig. 8—Heater Controls (Valiant)

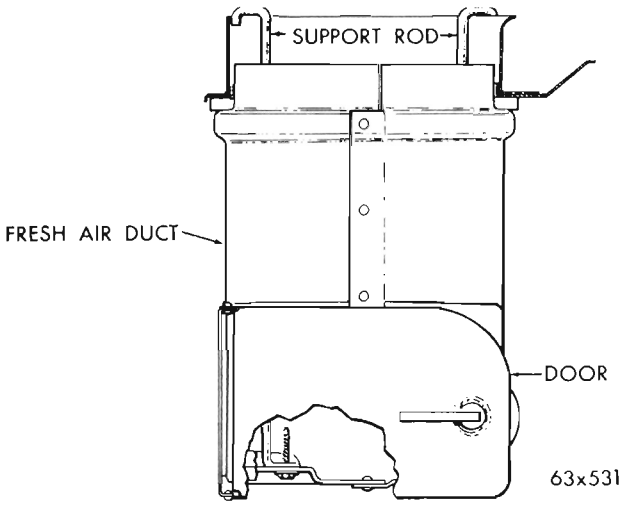


Fig. 9—Fresh Air Duct—Driver's Side (Valiant)

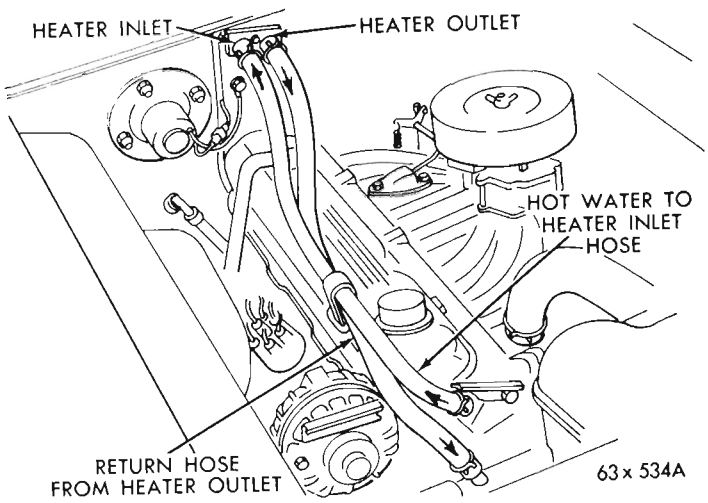


Fig. 11—Heater Hose Connections (Valiant)

(4) Remove the heater motor seal retainer plate and seal from the dash panel (Fig. 12).

(5) Disconnect the heater and defroster control cables from the heater assembly (Fig. 8).

(6) Remove the heater motor resistor wire from the resistor (Fig. 7).

(7) Remove the defroster tubes from the heater assembly.

(8) Disconnect the heater housing support rod from the fresh air duct (Fig. 7).

(9) Remove the heater assembly.

Disassembly

(1) Remove the seal from around the heater motor mounting studs.

(2) Remove the spring clips holding the spacers and heater motor to the heater housing.

(3) Remove the fan from the heater motor.

(4) Remove the mounting support plate from the heater motor.

(5) Remove the heater motor resistor assembly from the heater housing (Fig. 7).

(6) Remove the fresh air door seal from either the inner or outer heater housing half only.

(7) Remove the retainer clips attaching the heater housing halves together.

(8) Separate the heater housing halves.

(9) Remove the screw attaching the seal retainer and seal around the heater core tubes.

(10) Remove the heater core tube support clamp.

(11) Remove the screws attaching the heater core to the heater housing and remove the core.

(12) Remove the seal retainer and seal from the heater core.

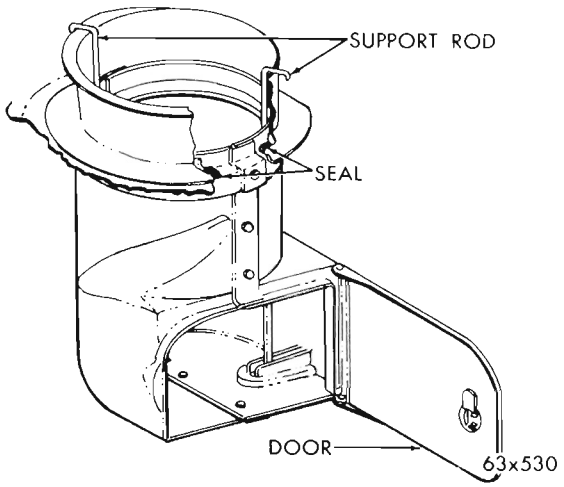


Fig. 10—Fresh Air Duct—Passenger Side (Valiant)

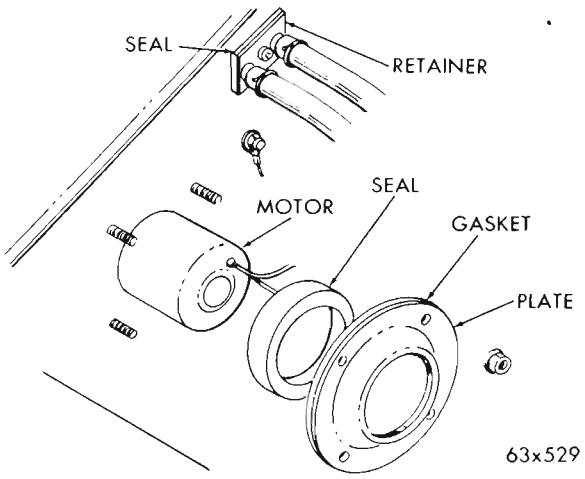


Fig. 12—Heater Mounting—Engine Side (Valiant)

Assembly

(1) Position the heater core in the heater housing.

(2) Slide the seal retainer and seal over the heater core tubes and up against the housing. Install the attaching screw.

(3) Install the heater core to housing screws.

(4) Position the support clamp over the heater core tubes and install the attaching screw.

(5) Install the support plate on the heater motor.

(6) Install the fan on the heater motor. Turn the fan to make certain it does not hit the motor support plate.

(7) Position the heater motor and support plate over the mounting studs on the heater housing.

(8) Install the spacers and retainers on the heater motor mounting studs.

(9) Position both housing halves together and install the retainer spring clips. Add sealer between the two halves before reassembly.

(10) Install the heater motor resistor assembly.

(11) Position and cement the seal around the fresh air door opening.

(12) Position the heater housing to dash panel seal around the heater housing mounting studs.

(13) Connect and adjust the heater-defroster cable and the temperature control cable to their respective control arms.

(14) Position the heater assembly on the dash panel by sliding the four mounting studs into their respective holes in the dash panel.

(15) In the engine compartment side, install the heater to dash panel seal, seal retainer and mounting nuts.

(16) Connect the wires to the heater motor.

(17) Position the seal and seal retainer over the heater tubes and install the attaching screws.

(18) Connect the heater hoses to the heater.

(19) In the passenger compartment side, connect the heater support rod to the heater housing.

(20) Connect the wire to the heater motor resistor.

(21) Connect and adjust the defroster control cable.

(22) Connect the defroster tubes to the heater.

(23) Fill the cooling system, start the engine and operate until the normal engine operating temperature is obtained.

(24) Test the operation of the heater assembly.

2. HEATER CONTROL CABLES—ADJUSTMENT (Fig. 8)

TEMP. (Temperature Control Cable)

To adjust the **TEMP** cable, remove the glove compartment box to gain access to the cable adjusting clamp.

HTR-DEF (Heater-Defroster Control Cable)

To adjust the **HTR-DEF** cable, remove the glove compartment box to gain access to the cable adjusting clamp.

DEF (Defroster Control Cable)

The **DEF** cable may be adjusted without removing any parts.

3. HEATER MOTOR OR FAN REPLACEMENT (Fig. 12)

To replace either the heater motor or fan assembly, remove the complete heater assembly (see Paragraph 3).

4. HEATER CORE REPLACEMENT

To replace the heater core assembly, remove the complete heater assembly (see Paragraph 5).

5. FRESH AIR DUCTS (Figs. 9 and 10)

Passenger Side—The fresh air duct on the passenger side is an integral part of the heater.

Drivers Side—The fresh air duct on the driver's side is attached to the plenum chamfer by two support rods.

RADIO AND ANTENNA

Plymouth Models are equipped with a fully transistorized A.M. radio model 220. Valiant Models are equipped with a fully transistorized radio model 218. Models 220 and 218 feature a single-ended audio output. Also available, as optional equipment, on Plymouth Models is a fully transistorized A.M.-F.M. radio model 335.

SERVICE PROCEDURES

1. RADIO REMOVAL AND INSTALLATION

Removing the Radio (Plymouth)

NOTE: For vehicles equipped with air-conditioning the radio is serviced through the glove box opening in the instrument panel.

(1) Disconnect the battery ground cable.

(2) Remove the control knobs from the front of the radio.

(3) From under the instrument panel disconnect the radio feed and radio illumination wires at the fuse block.

(4) Disconnect the antenna and radio speaker leads.

(5) Remove the screw attaching the radio mounting bracket to the instrument panel lower reinforcement.

(6) Loosen the top screw on the radio mounting bracket and remove the mounting bracket.

(7) From the front of the radio remove the two nuts attaching the radio to the instrument panel and remove the radio from under the instrument panel.

Removing the Radio (Valiant)

(1) Disconnect the battery ground cable.

(2) Remove the control knobs from the front of the radio.

(3) Remove the bottom screw from the radio mounting bracket.

(4) Remove the left defroster tube.

(5) Loosen the top screw on the radio mounting bracket and remove the bracket.

(6) Disconnect the speaker and antenna leads.

(7) Remove the mounting nuts from the front of the radio.

(8) Remove the radio Bezel.

(9) Lower the radio and disconnect the radio power feed cable.

(10) Remove the radio from under the instrument panel.

Installing the Radio (Plymouth)

NOTE: For vehicles equipped with air-conditioning the radio is serviced through the glove box opening in the instrument panel.

(1) From under the instrument panel position the radio into the instrument panel opening.

(2) From the front of the radio install the two nuts that attach the radio to the instrument panel. Tighten the nuts securely.

(3) Position the top of the radio mounting bracket under the mounting screw on the back of the radio. Tighten the screw securely.

(4) Install the screw that attaches the bottom of the radio mounting bracket to the instrument panel lower reinforcement.

(5) Connect the radio feed and radio illumination wires at the fuse block on the instrument panel lower reinforcement.

(6) Connect the antenna and radio speaker leads.

(7) Install the radio control knobs.

(8) Connect the battery ground cable.

Installing the Radio (Valiant)

(1) Position the radio assembly under the instrument panel and connect the radio power feed cable.

(2) Position the radio into the instrument panel.

(3) Install the radio bezel.

(4) Install the mounting nuts on the front of the radio.

(5) Connect the speaker and antenna leads.

(6) Install the radio mounting bracket. Tighten the screws securely.

(7) Connect the left defroster tube.

(8) Install the control knobs on the radio.

(9) Connect the battery ground cable and test the operation of the radio.

2. SPEAKER REMOVAL AND INSTALLATION

Removing the Speaker (Plymouth)

NOTE: For vehicles equipped with air-conditioning the radio speaker is serviced through the glove box opening in the instrument panel.

(1) Remove the radio as outlined in Paragraph 1.

(2) From under the instrument panel remove the four nuts that attach the speaker mounting plate to the instrument panel. As an aid to service, use a flexible drive socket wrench to remove the mounting nuts.

(3) Remove the radio speaker and speaker mounting plate as an assembly.

Removing the Speaker (Valiant)

(1) Remove both defroster hoses.

(2) Remove the speaker leads.

(3) Remove the two nuts mounting the speaker and adapter plate assembly to the instrument panel.

(4) Remove the speaker and adaptor assembly from under the instrument panel.

(5) Remove the screws mounting the speaker to the adaptor plate.

Installing the Speaker (Plymouth)

NOTE: For vehicles equipped with air-conditioning the radio speaker is serviced through the glove box opening in the instrument panel.

(1) From under the instrument panel position the radio speaker and speaker mounting plate as an assembly on to the four mounting studs on the instrument panel.

(2) Install the four speaker mounting nuts. Tighten the nuts securely.

(3) Install the radio as outlined in Paragraph 1.

Installing the Speaker (Valiant)

(1) Install the adapter plate on the speaker.

(2) Position the speaker and adapter plate on the instrument panel and install the two mounting screws.

(3) Connect the speaker leads.

(4) Connect both defroster leads.

(5) Test the operation of the radio and speaker.

3. PUSH BUTTON ADJUSTMENT

(1) Extend the antenna fully and turn the radio on for fifteen minutes.

(2) Unlock the push button by pulling it out.

(3) Manually tune in the desired station and relock the push button by pushing it all the way in.

(4) Repeat the operation on the other push buttons as necessary.

4. ON-OFF SWITCH AND VOLUME CONTROL

The on-off switch and volume control are combined and operate from the left-hand radio knob.

5. INTERFERENCE ELIMINATION

When installing any suppression item, make certain that all paint and dirt is removed from the grounding area between the capacitors and the engine or body components. Tighten all nuts and bolts securely.

The high tension circuit of the engine ignition system uses radio resistance wire as standard equipment. The balance of the suppression equipment is installed as follows:

Install the ignition coil capacitor, as shown in Figure 1.

NOTE: The alternator is equipped with an internal capacitor which is integral with the output stud.

Install the thermal gauge suppression capacitor on the back of the instrument cluster.

NOTE: Voltage regulator suppressors should be used to assist in curing stubborn cases of radio interference.

6. FADER CONTROL

This control is used only when the vehicle is equipped with a rear seat speaker. Full "counterclockwise" position allows operation of the front speaker. Full "clockwise" position allows the operation of the rear seat speaker. Rotation between either position will allow both speakers to operate with

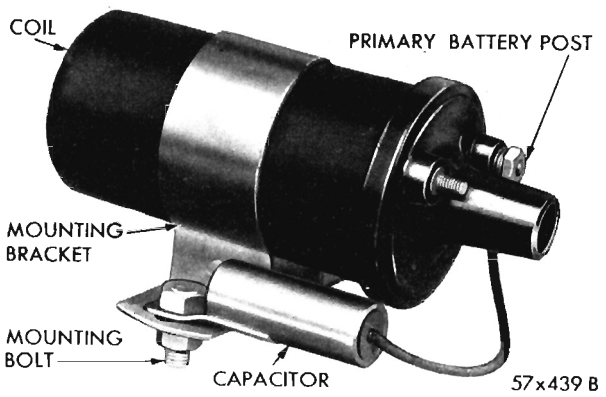


Fig. 1—Ignition Coil Capacitor

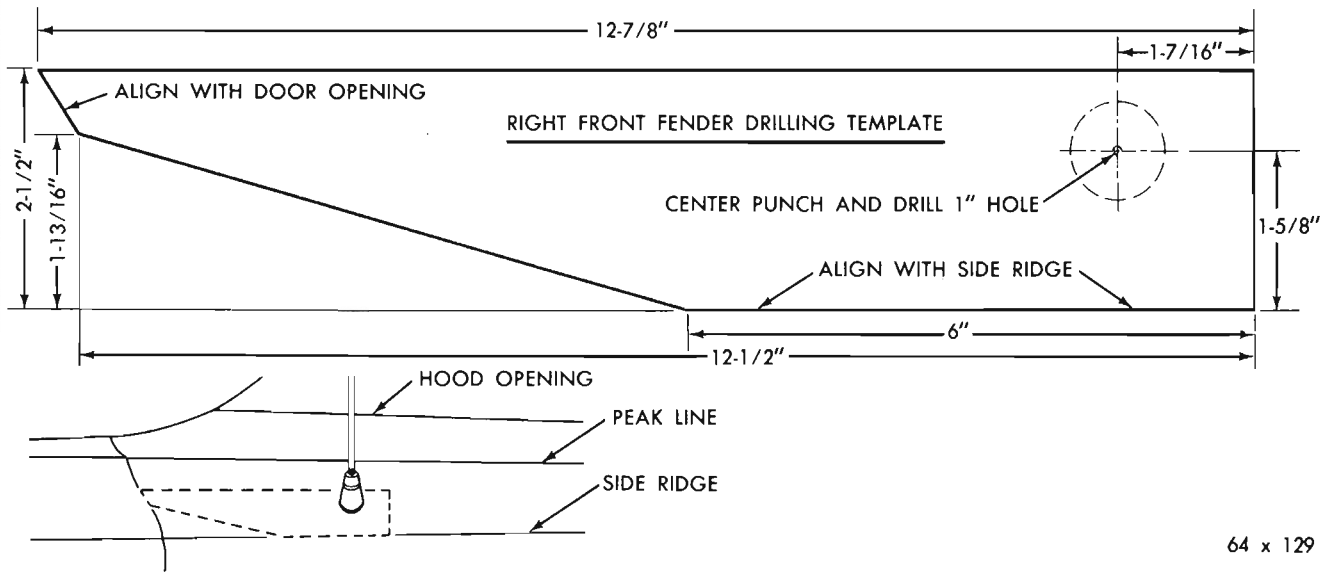


Fig. 2—Antenna Mounting Location—Plymouth

varying volume as desired, or with equal volume at the mid-position. If the vehicle is equipped with a radio speaker reverberator the reverberator control on the instrument panel replaces the fader control. Pull the control knob "**OUT**" to turn "**ON**" the reverberator. Push the control knob "**IN**" to turn "**OFF**" the reverberator and give normal fader control operation.

7. ANTENNA TRIMMER

All radios are pre-trimmed at the factory and should require no further trimming adjustment. However, whenever a radio is removed from the vehicle for repair, after the radio is re-installed, the antenna trimmer should always be adjusted as follows:

(1) Operate the radio for 15 minutes.

(2) Extend the antenna to 40 inches.

(3) Manually tune the radio to noise or a weak signal between 1400 and 1600 K.C.

(4) Increase the radio volume to full volume and the tone control to maximum treble (fully clockwise).

(5) Adjust the antenna trimmer by carefully turning it back and forth until the position is found that gives a peak response in volume. Maximum output indicates the proper point of antenna trimmer adjustment.

8. ANTENNA REPLACEMENT

When installing the antenna, care should be taken

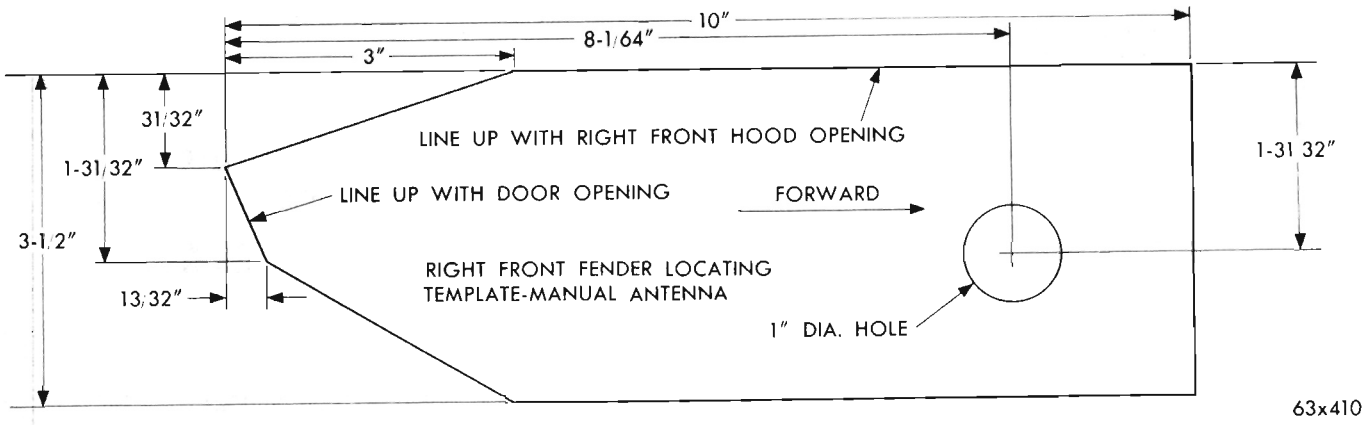


Fig. 3—Antenna Mounting Location—Valiant

to route the "lead-in" cable over the glove box compartment to allow for ample cable length when plugging the "lead-in" cable into the radio receptacle.

Refer to Figures 2 or 3 for the antenna mounting points on initial installations.

Removal

(1) Unplug the antenna lead from the radio receiver.

(2) Remove the splash shield cover plate. (If so equipped.)

(3) Remove the antenna attaching nut, retainer, and gasket.

(4) Withdraw the antenna assembly from the fender, splash shield and body opening.

Installation

(1) Install the antenna body, mast and lead.

(2) Install the antenna gasket, adaptor and attaching cap nut.

(3) Install the "lead-in" cable in the fender splash shield and the body opening.

(4) Plug in the "antenna lead-in" cable in the radio receptacle.

(5) Test the radio for proper operation.

9. "AM-FM" RADIO (If so equipped)

The "AM-FM" radio allows reception of both "AM-FM" broadcast frequencies. To select "AM" or "FM" reception move the selector slide bar (Figure 4) to the desired position. The tuning knob, the "On-Off" and "Volume" control knob operate in the same manner as the standard AM radio.

The following items should be noted for proper "AM-FM" radio operation:

(1) If the antenna trimming is required, tune the radio dial below 1000 K.C. (about 960 K.C.) with the selector slide bar in the "AM" position. Proceed with the antenna trimming procedure as outlined in Paragraph 7.

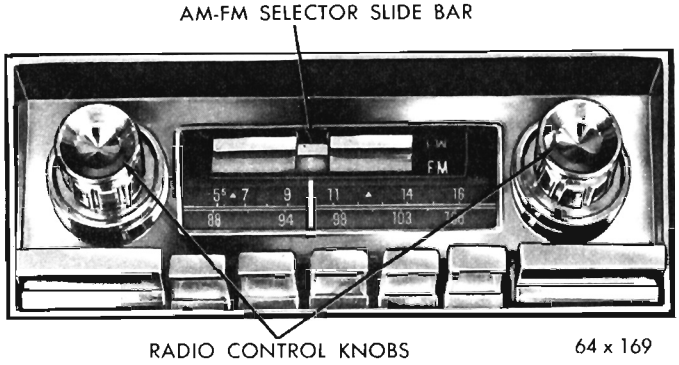


Fig. 4—AM-FM Radio

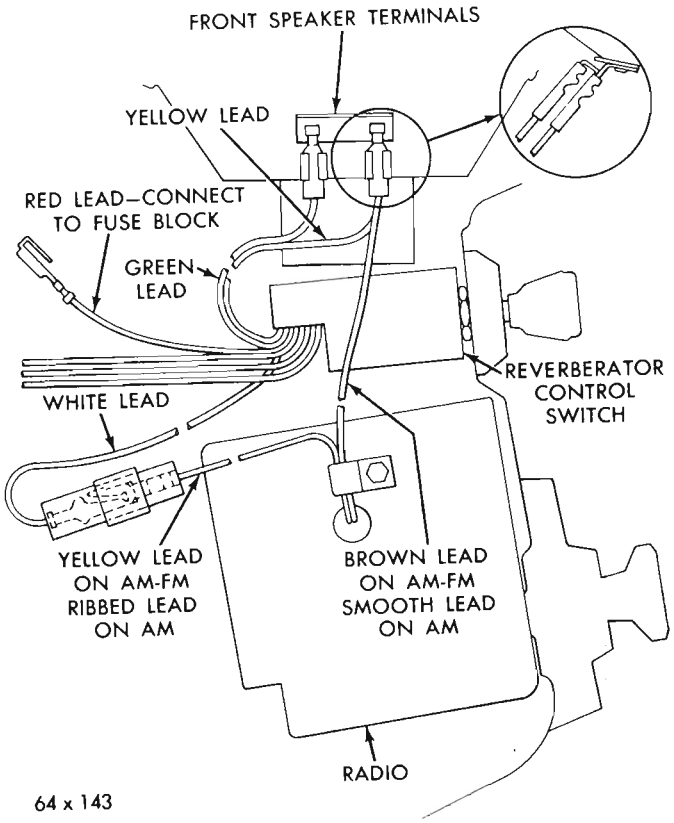


Fig. 5—Reverberator Installation

(2) The antenna should be extended to a height of 31 inches for maximum "FM" reception.

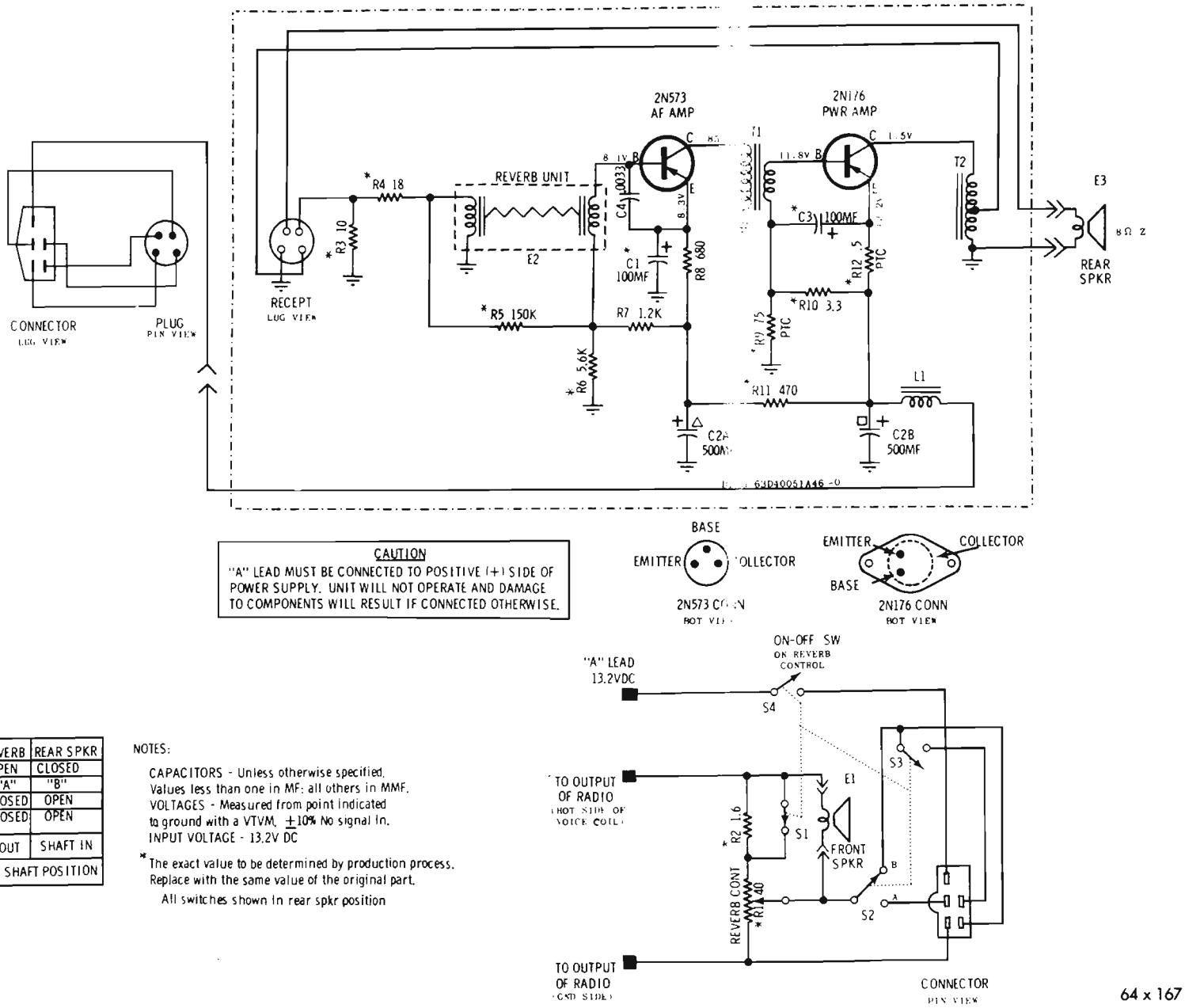
(3) The radio push button adjustment is the same as the standard "AM" radio. It should be noted that a push button adjustment is only good for one station (either "AM" or "FM") not both at the same time.

(4) Should a malfunction occur, the repair procedures are the same as for the standard "AM" radio.

10. RADIO SPEAKER REVERBERATOR (If so equipped)

The radio speaker reverberator is used to produce a time delay of .025 to .030 seconds in the radio output to the rear seat speaker. The reverberator does not cause any time delay in the radio output to the front speaker. Due to the "time difference" of the radio output between the front and rear speakers an "echo" is produced which gives the effect of "Stereo" sound reproduction in the vehicle.

The reverberator consists of the reverberator unit (mounted in the luggage compartment), the instrument panel switch and the wiring from the switch to the reverberator unit (Figure 5). The reverberator is an independently powered unit and has its voltage supply separate from the voltage supply to the radio.



	REVERB	REAR SPKR
S1	OPEN	CLOSED
S2	"A"	"B"
S3	CLOSED	OPEN
S4	CLOSED	OPEN
SHAFT OUT		SHAFT IN
REVERB SHAFT POSITION		

NOTES:

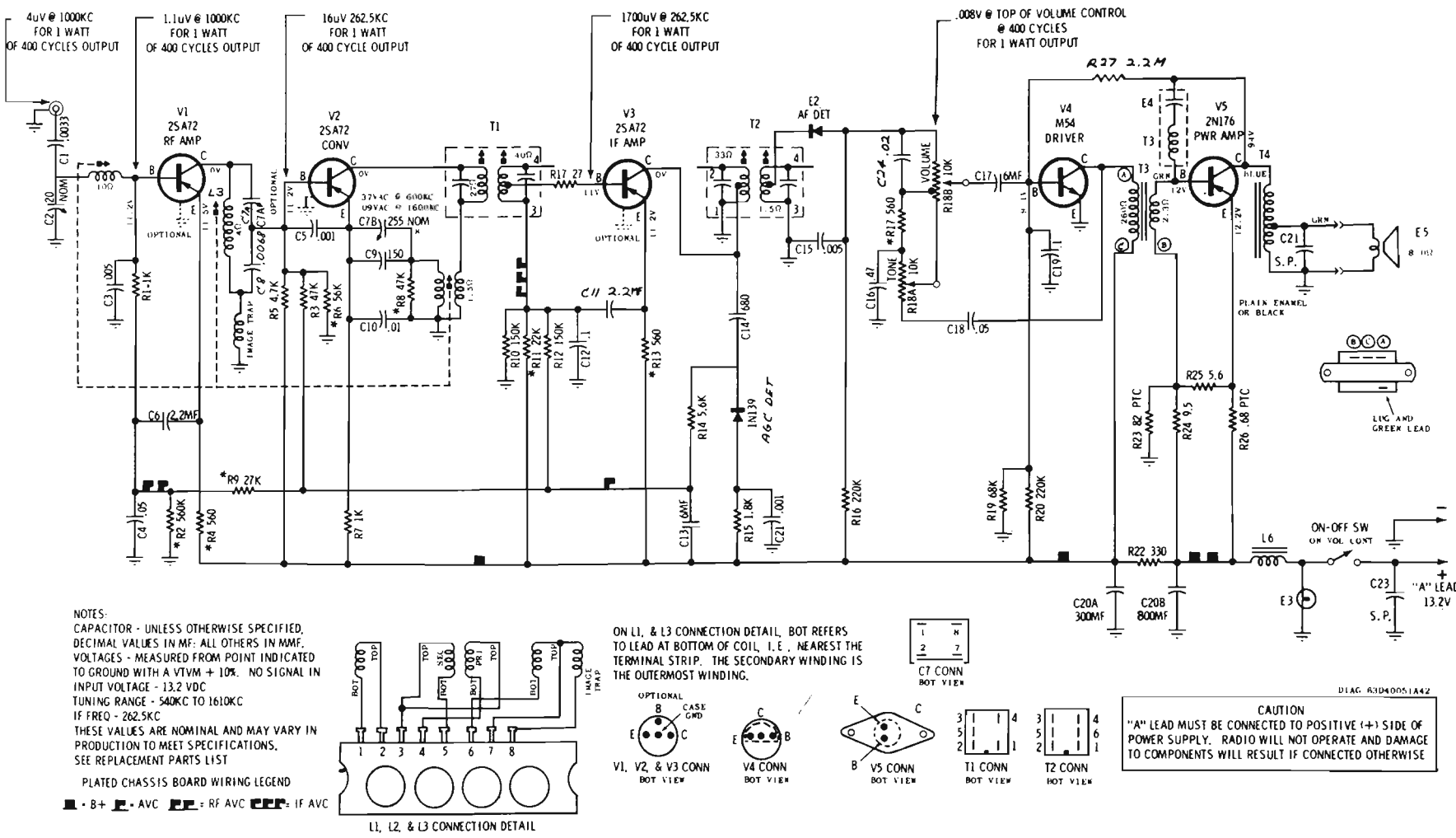
CAPACITORS - Unless otherwise specified. Values less than one in MF; all others in MMF.
VOLTAGES - Measured from point indicated to ground with a VTVM, ±10% No signal In.
INPUT VOLTAGE - 13.2V DC

*The exact value to be determined by production process. Replace with the same value of the original part.

All switches shown in rear spkr position

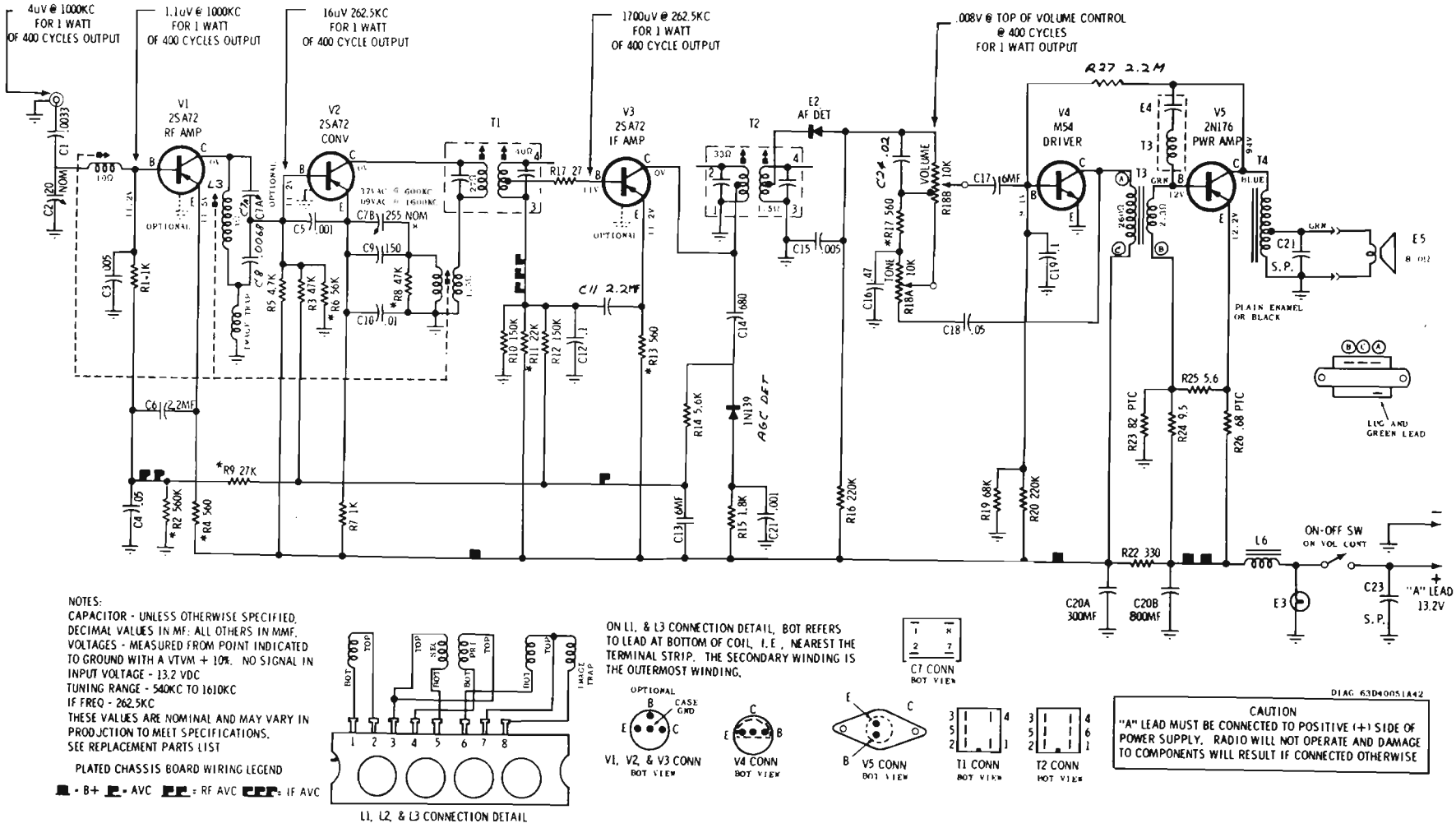
64 x 167

Fig. 6—Reverberator Wiring Diagram



64 x 166

Fig. 7—Radio Model 218



64 x 166

Fig. 8—Radio Model 220

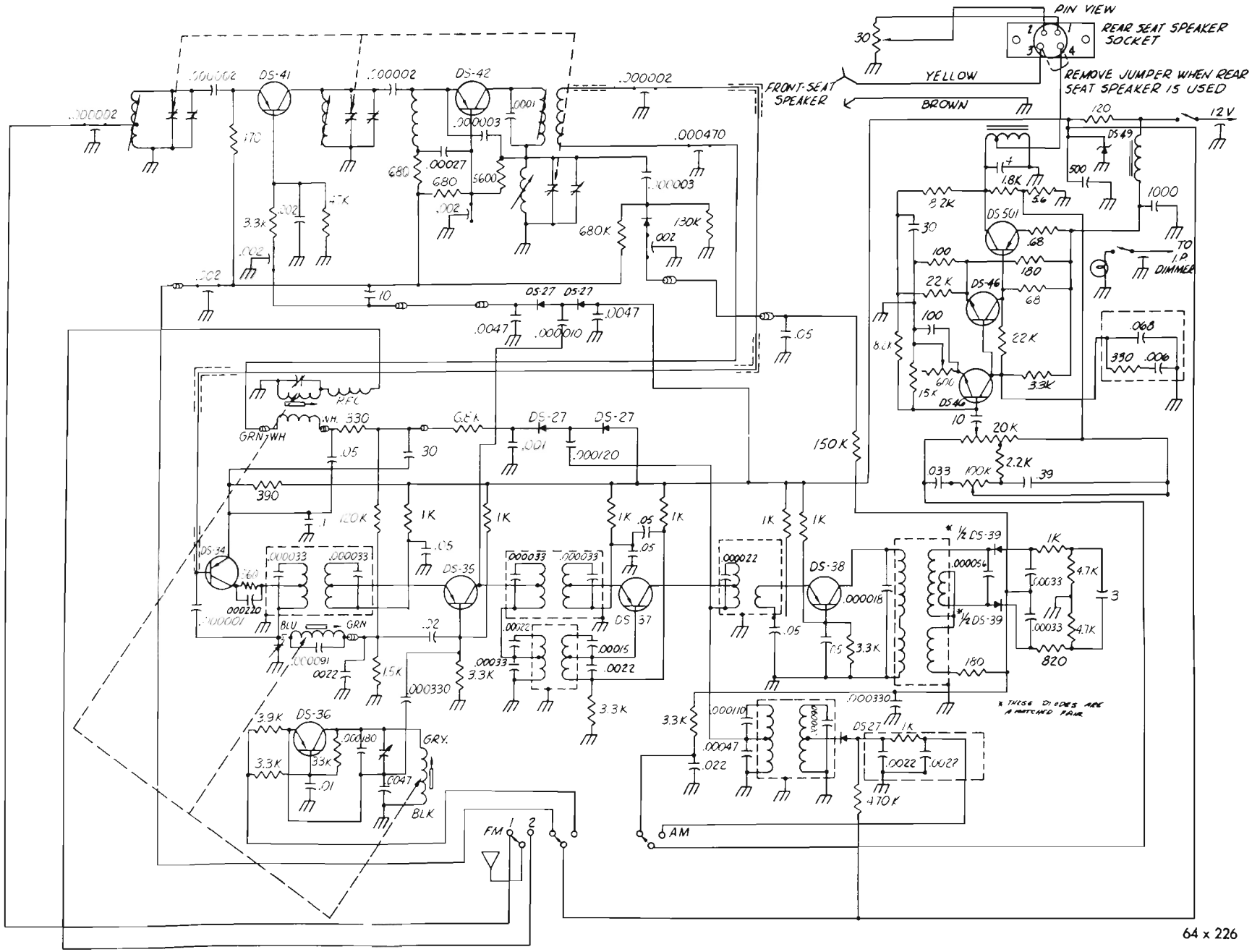


Fig. 9—Radio Model 335

To operate the reverberator turn the radio "ON" and tune the radio to the desired station. Pull the instrument panel reverberator switch "out" and then rotate the switch until the desired volume level between the front and rear speakers is achieved. With the switch "in" normal fader operation exists between the front and rear speakers by rotating the switch knob until the desired volume level is established between the speakers.

For service the reverberator unit is divided in two parts (Fig. 6):

(1) **Delay Line.** This item cannot be repaired, it must be serviced as an assembly.

(2) **Amplifier Section.** This item is serviced using normal radio trouble shooting procedures.

11. RADIO WIRING DIAGRAMS

Refer to Figure 7 for radio model 218, Figure 8 for radio model 220, Figure 9 for radio model 335.

WINDSHIELD WASHER

The windshield washers are operated by an electric motor driven pump to which fluid is gravity fed from a plastic reservoir. The motor is operated by depressing a small button in the center of the windshield wiper knob.

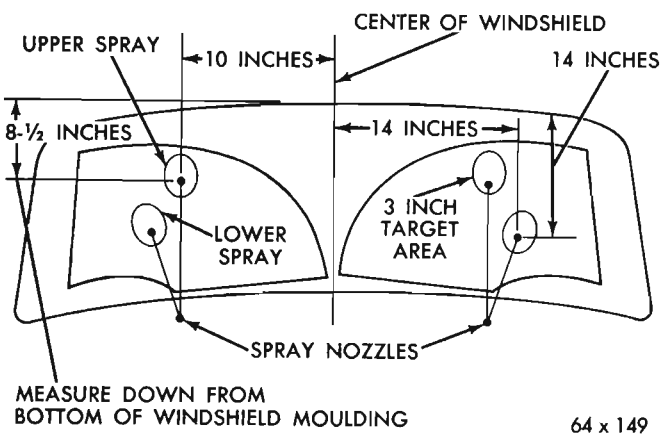


Fig. 1—Washer Aiming Instructions (Plymouth)

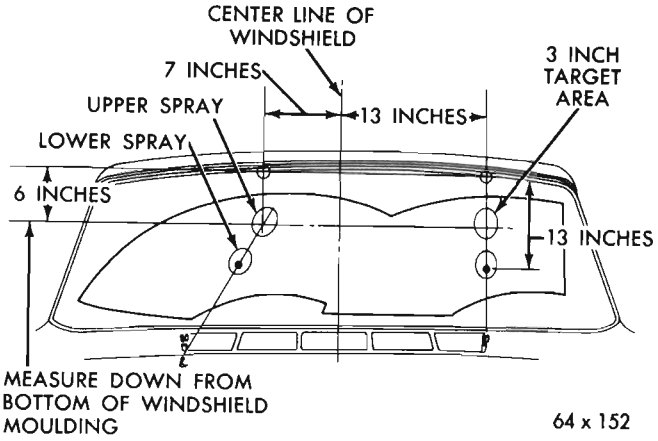


Fig. 2—Washer Aiming Instructions (Valiant)

1. NOZZLE ADJUSTMENT

Adjustment of the nozzle may be made by inserting a small screwdriver into the cowl opening grille and bending the nozzle.

Adjust the nozzles so that the centers of the streams contact the windshield glass, as shown in Figures 1 and 2.

NOTE: The oval pattern formed by the stream striking the windshield glass is not "centered" on the center of the stream. The stream center is toward the bottom of the oval pattern.

SERVICE DIAGNOSIS

ELECTRIC CLOCK

Condition	Possible Cause	Correction
Clock Does Not Operate	(a) Wire loose or off of terminal.	(a) Install connector on the terminal.
	(b) Internal short.	(b) Replace the clock.

HEATER

Insufficient Heat	(a) Temperature control valve not opening (Plymouth only).	(a) Adjust or replace valve as necessary.
	(b) Engine thermostat opening too soon, too wide, or at low temperature.	(b) Replace thermostat.
	(c) Faulty push button controls (Plymouth only).	(c) Replace push button switch.
	(d) Vacuum line to shut-off damper disconnected or broken (Plymouth only).	(d) Connect or replace vacuum line.
	(e) Faulty vacuum actuator or broken or cracked nipple (Plymouth only).	(e) Replace the vacuum actuator or nipple.
	(f) Insufficient coolant in radiator.	(f) Fill radiator to the correct level.
	(g) Collapsed water hose on the return side, or partially plugged hose on the pressure side.	(g) Replace hose or remove obstruction as necessary.
	(h) Heater system airbound; needs bleeding.	(h) Bleed the heater system.
	(i) Blower motor not operating, fuse blown, faulty wiring or loose connections.	(i) Replace the fuse or wiring, or install the connections securely.
	(j) Improper control cable adjustment.	(j) Adjust the control cables.
Too Much Heat	(a) Temperature control valve stuck in open position (Plymouth only).	(a) Adjust or replace the valve.
	(b) Disconnected or broken bowden cable wire.	(b) Connect or replace the control cable.
	(c) Engine thermostat controlling at too high a temperature.	(c) Replace the thermostat.
	(d) Thermostat stuck in closed position.	(d) Replace the thermostat.
	(e) Temperature control valve not closing properly, cable needs adjusting (Plymouth only).	(e) Adjust the control cable.
Blower Motor Not Operating	(a) Fuse blown.	(a) Replace the fuse.
	(b) Faulty motor.	(b) Replace the motor.
	(c) Faulty electrical connections.	(c) Repair the connections as necessary.
	(d) Push button not completing circuit (Plymouth only).	(d) Replace the switch.

SERVICE DIAGNOSIS

RADIO

Condition	Possible Cause	Correction
Radio is Inoperative	(a) Blown fuse.	(a) Replace the fuse.
	(b) Broken, loose or shorted antenna lead-in.	(b) Test with an auxiliary antenna and replace lead-in if necessary.
	(c) Loose battery cable.	(c) Test the voltage at the fuse and tighten all connections.
	(d) Burned out transistor.	(d) Test all transistors and replace weak ones.
	(e) Faulty speaker.	(e) Replace the speaker.
	(f) Faulty antenna.	(f) Test the antenna and repair.
Radio Reception is Weak	(a) Unbalanced antenna trimmer.	(a) Adjust the antenna trimmer.
	(b) Loose antenna lead-in.	(b) Tighten the antenna lead-in.
	(c) Shorted antenna lead-in.	(c) Test with an auxiliary antenna and replace lead-in if necessary.
	(d) Weak radio transistor.	(d) Test and replace weak transistors.
	(e) Faulty antenna.	(e) Test the antenna and correct.
Radio Reception is Noisy (Engine Running)	(a) Outside electrical interferences.	(a) Move the car or eliminate interference.
	(b) Insufficient or faulty radio capacitors.	(b) Install capacitors in ignition system.
Radio Reception is Noisy (Vehicle in Motion)	(a) Static build up in tires.	(a) Ground the tires to the wheels with powdered graphite.
	(b) Loose antenna or lead-in wire.	(b) Tighten the antenna attaching nut. Inspect the fit of the antenna lead-in plug in the socket.
Radio is Noisy When Equipment is Operated	(a) Loose antenna ground.	(a) Clean and tighten the antenna connections.
Radio Reception is Distorted	(a) Speaker coil rubbing on voice core.	(a) Install an auxiliary speaker and compare. Replace if improved.
	(b) Torn speaker cone.	(b) Replace the speaker.
	(c) Faulty radio transistors.	(c) Test and replace any faulty transistors.
Intermittent Reception	(a) Broken lead-in wire.	(a) Test with a substitute antenna. Repair the lead-in wire.
	(b) Ground lead-in wire.	(b) Test with a substitute antenna. Repair the lead-in wire or replace.
	(c) Faulty radio transistor.	(c) Test the radio transistors and replace as necessary.

SERVICE DIAGNOSIS

WINDSHIELD WASHER

Condition	Possible Cause	Correction
Motor Does Not Run	(a) Loose wiring terminals.	(a) Tighten the terminals.
	(b) Corroded terminals.	(b) Clean and tighten the terminals.
	(c) Broken wires.	(c) Repair or replace the wires.
	(d) Faulty switch.	(d) Replace the wiper switch assembly.
	(e) Faulty motor.	(e) Replace the motor and pump assembly.
	(f) Poor ground.	(f) Clean the pump housing and tighten the mounting screws.
Pump Does Not Operate Motor Runs	(a) Broken coupling.	(a) Replace the motor and pump assembly.
	(b) Faulty pump.	(b) Replace the motor and pump assembly.

GROUP 2

FRONT SUSPENSION

CONTENTS

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Specifications	1	Lower Control Arm and Shaft	6
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Front Suspension Height Adjustment	4	Upper Ball Joints	11
Front Wheel Alignment	5	Sway Bar	12
Torsion Bars	5	Front Suspension "K" Member	12
		Service Diagnosis	13

SPECIFICATIONS

	Plymouth VP-2, VP-1	Valiant VV-1
CAMBER		
Left	+¼° to +¾° (+½° preferred)	
Right	0° to +½° (+¼° preferred)	
CASTER		
Manual Steering	0° to −1°	
Power Steering	+¼° to +1¼° (Drivers side should be less positive)	
HEIGHT		
Standard Suspension	1¾ inch ± ⅛ inch	2 inch ± ⅛ inch
Heavy Duty	2⅛ inch	2⅜ inch
Side to Side Difference (Max.)	⅛ inch	
TOE-IN	⅛ inch ± 1/32 inch	
TOE-OUT ON TURNS	Inner Wheel 20° when Outer Wheel is 17½° (±1°)	
TREAD		
Front	59.4 inches	55.94 inches
Rear	57.5 inches	55.56 inches
WHEEL BASE	116 inches	106 inches

TOOL LIST

C-3466 . . . . . Engine Lifting Fixture (8-Cylinder Engine)
C-3560 . . . . . Ball Joint Remover or Installer (Upper) (Plymouth)
C-3710 . . . . . Upper Control Arm Bushing Remover or Installer
SP-3828 . . . . . Adapter—Used on Police and Taxi Units—Remover
SP-3827 . . . . . Adapter—Used on Police and Taxi Units—Installer
C-3711 . . . . . Ball Joint Stud Remover (Upper)
C-3713 . . . . . Upper Ball Joint Seal Installer (Valiant)
C-3714 . . . . . Ball Joint Remover or Installer (Valiant)
C-3728 . . . . . Torsion Bar Remover
C-3736 . . . . . Upper Ball Joint Seal Installer (Plymouth)
SP-3208 . . . . . Stud } Make Tool C-3736
SP-3307 . . . . . Cup }
C-3804 . . . . . Engine Lifting Plate (6-Cylinder Engine)
C-3809 . . . . . Engine Lifting Fixture (6-Cylinder Engine)
C-3846 . . . . . Ball Joint Stud—Lower—Remover
C-3848 . . . . . Lower Control Arm Shaft and Bushing Installer
C-3894 . . . . . Tie Rod End Stud Remover

TORQUE REFERENCE

	Foot-Pounds
Ball Joint—(Upper)	125 (minimum)
Ball Joint—(Lower) Stud Nuts	100
Ball Joint—(Upper) Stud Nuts (Plymouth)	100
(Valiant)	55
Control Arm (Lower) Shaft Nut	180
(Rebound Bumper)	200 (inch-pounds)
Front Suspension ("K") Crossmember Bolts	150
Idler Arm Stud Nut (at Mounting Bracket)	45
(at Center Link)	40
Steering Knuckle to Bracket Bolt Nuts (Upper)	55
Plymouth (Lower)	120
Valiant (Lower)	100
Strut—Front Bushing Nut	40
Strut—To Control Arm Nuts (Rear)	110
Tie Rod Clamp Bolt Nuts	15
Tie Rod Stud Nuts (to steering knuckle arms)	40
Shock Absorbers	
Front—Upper	25
Lower	55
Wheel Mounting	
(Plymouth)	65
(Valiant)	55
Sway Bar (When so equipped)	
Cushion Housing Nuts	35
Link Nuts	100 (inch-pounds)
Lower Control Arm Shaft Nut	130

FRONT SUSPENSION

Construction of the fully unified body employs a bolted-on engine and front suspension support member ("K" member), which is attached to the body horizontals (side rails) at four points. The lower control arm pivot shafts and struts are attached to the legs of the "K" members, as shown in Figures 1 and 2.

The torsion bar rear anchors are integral with the engine rear support member in the body. The torsion bar front anchors, which are part of the lower control arms, provide the means of adjustment or setting of vehicle front height. The lower ball joints are integral with the steering arms.

All ball joints and the torsion bars at the front of the rear anchors are effectively sealed against road splash by tightly fitted balloon type flexible seals. The ball joints are of the semi-permanent lubricated type and should not under normal operating conditions require lubrication with the specified lubricant before 32,000 miles.

When re-lubrication of the ball joints and tie rod end assemblies is required it is necessary to remove the plugs and install a grease fitting. After the lubrication is completed, remove the grease fittings and reinstall the plugs.

All service replacement ball joints are equipped with a "Knock-Off" type lubrication fitting. After the ball joint has been lubricated with the specified lubricant, knock off that portion of the lubrication fitting over which the grease gun was installed. A special ball check is installed in the remaining portion of the fitting to prevent foreign materials from passing through the fitting.

The tie rod end seals and protectors should be inspected at all oil change periods. The tie rod end seals and seal protectors are serviced separately.

Caster and camber adjustments are made by cams on the upper control arm pivot bolts.

Rubber bushings should not be lubricated at any time. When replacement of a bushing is necessary, water may be used to aid in installation.

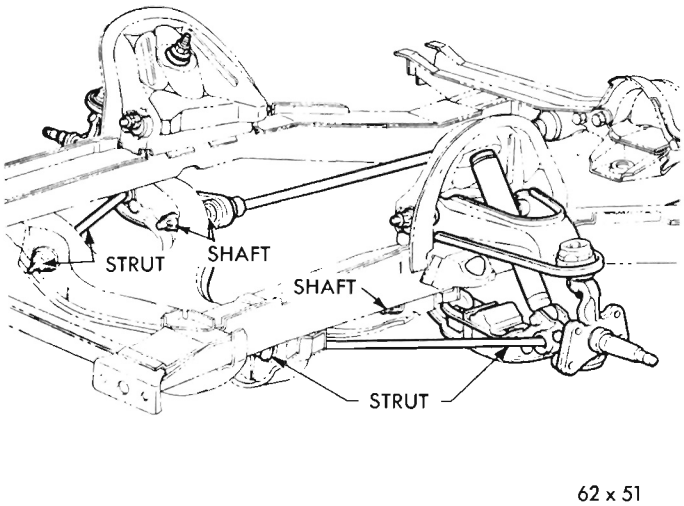


Fig. 1—Front Suspension Mounting Points (Plymouth)

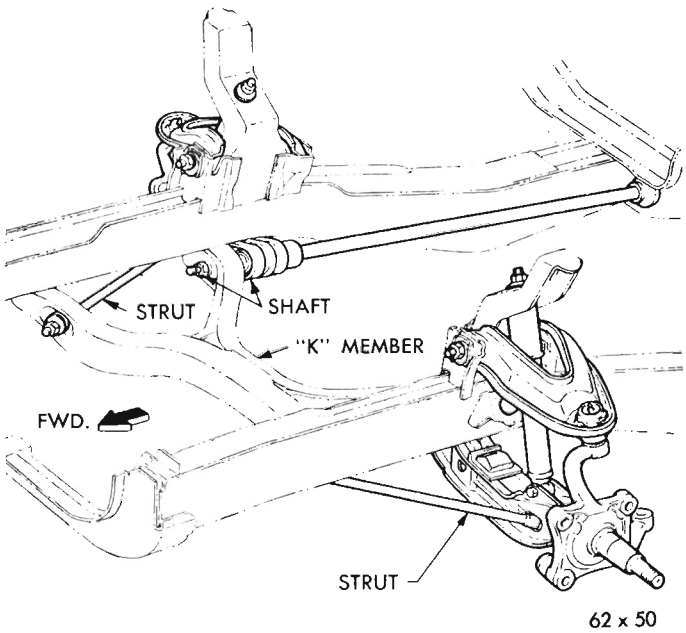


Fig. 2—Front Suspension Mounting Points (Valiant)

SERVICE PROCEDURES

1. PREPARATION FOR INSPECTING THE FRONT WHEEL ALIGNMENT

Front wheel alignment is the mechanics of adjusting all the interrelated factors affecting the running and steering of the front wheels of the vehicle. Incorrect alignment of front wheels will result in hard steering, abnormal tire wear as well as braking problems.

The method of inspecting the alignment will vary depending on the type of equipment being used. The instructions furnished by the manufacturer of the equipment should always be followed, however, the specifications as recommended by the Chrysler Corporation should always be used.

All inspections and adjustments should be made in the following order:

Front Suspension Height

Caster and Camber

Toe-In

Steering Axis Inclination

Toe-out On Turns

An inspection of the steering axis inclination and toe-out on turns is valuable in determining if parts are bent or damaged particularly when adjustments will not bring camber and caster within specifications. **DO NOT ATTEMPT TO MODIFY ANY OF THESE PARTS BY HEATING OR BENDING.**

Before any attempt is made to change or correct caster, camber and toe-in, the following preliminary inspections and necessary corrections must be made on those parts which influence the steering of the vehicle.

(1) Inflate the tires to the recommended pressure. All tires should be the same size, in good condition and have equal wear. Note the type of wear to aid in diagnosing. See Group 22, "Wheels, Bearings and Tires".

(2) Inspect the suspension and steering linkage pivot points for excessive looseness, rear springs for proper tightness of "U" bolts and height differential between the left and right sides of the vehicle. (The vehicle shall be on a level floor or alignment rack) and should have a full fuel tank but no luggage or passenger load.

(3) Inspect the front wheel bearing adjustment. See Group 22, "Wheels, Bearings and Tires". Measure the front wheel and tire assembly runout (follow the Equipment Manufacturers Instructions).

(4) To obtain accurate readings, the vehicle should be jounced in the following manner just prior to taking each measurement (Height-Caster-Camber and Toe): Grasp the bumpers at the center (rear bumper first) and jounce up and down several times. Release the bumpers on the down cycle after jouncing both rear and front ends an equal number of times.

2. FRONT SUSPENSION HEIGHT ADJUSTMENT

Standard suspension (including all Station Wagons)

(Plymouth 1¾ inches ±⅛ inch)

(Valiant 2 inches ±⅛ inch)

Heavy Duty Suspension

(Plymouth 2⅛ inches ±⅛ inch)

(Valiant 2⅜ inches ±⅛ inch)

Side to Side Difference ⅛ inch for all Models.

Front suspension heights must be held to specifications for a satisfactory ride, correct appearance, proper front alignment and reduced tire wear.

The heights should only be measured when the vehicle has the recommended tire pressures, a full tank of fuel, no passenger load and is placed on a level floor or alignment machine.

(1) Clean all foreign material from the bottom of the steering knuckle arm assemblies and from the lowest area of the height adjusting blades directly below the center of the lower control arm inner pivots.

(2) Jounce the vehicle several times releasing it on the downward motion.

(3) Measure the distance from the lowest point of one adjusting **blade** to the floor (measurement A) and from the lowest point of the steering knuckle arm, on the same side (measurement B) to the floor (Fig. 3). **Measure only one side at a time.** The differential between measurement A and B should be:

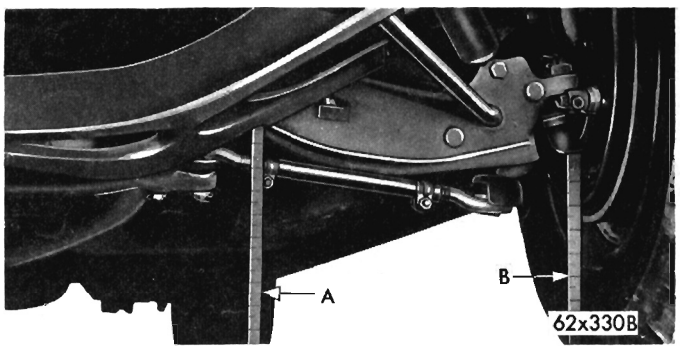


Fig. 3—Measuring Front Suspension Heights

Standard Suspension (including all Station Wagons)

(Plymouth 1¾ inches ±⅛ inch)

(Valiant 2 inches ±⅛ inch)

Heavy Duty Suspension

(Plymouth 2⅛ inches ±⅛ inch)

(Valiant 2⅜ inches ±⅛inch)

(4) Measure the other side in the same manner. The maximum allowable difference in suspension height from side to side is ⅛ inch on all Models.

(5) Adjust if necessary by turning the torsion bar adjusting bolt to increase the height and backing off the bolt to decrease the height.

(6) After each adjustment jounce the vehicle before rechecking measurements. Both sides should be measured even though only one side has been adjusted.

3. FRONT WHEEL ALIGNMENT

(Camber—Left wheel +¼° to +¾° (preferred +½°)

(Right Wheel 0° to +½° (preferred +¼°)

(Caster —Power Steering +¼° to 1¼°)

(Manual Steering 0° to — 1°)

Toe—⅛ + or — 1/32 inch.

Front wheel alignment settings must be held to specifications to hold tire wear to a minimum and to maintain steering ease and handling of the vehicle.

Wheel alignment measurements should only be measured with the tires inflated to the recommended pressure, no passenger load, correct vehicle height, full tank of fuel, and with the full weight of the vehicle on the wheels. The equipment manufacturers recommended procedure should always be followed. Any parts of the front suspension system should be replaced if they are found to be bent. **Do not attempt to straighten any bent part.**

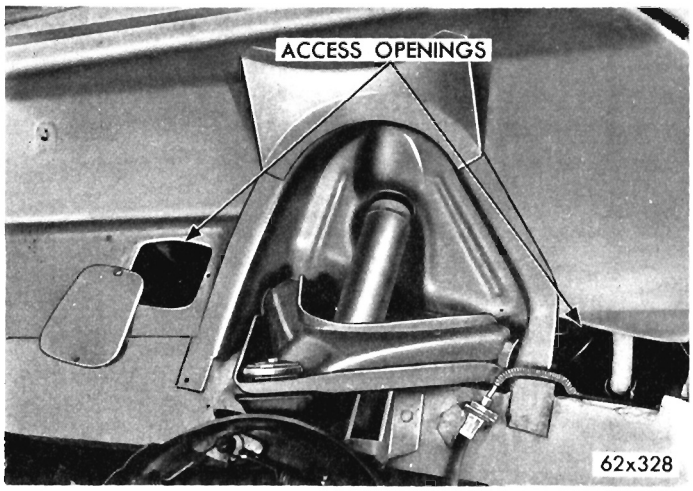


Fig. 4—Access Openings in Fender Shield

Camber and Caster

Access holes to loosen the upper control arm cam bolt nuts have been provided for in the fender side shields (Fig. 4) of the Plymouth vehicles. The front access hole is made available by removing splash cover tapping screws and cover. **When adjusting the right front cam bolt on Plymouth vehicles equipped with the 318 cubic inch engine, it is necessary to loosen the alternator and move it out of the way.**

(1) Remove all foreign material from the exposed threads of the cam adjusting bolts.

(2) Prepare the vehicle for inspection as outlined in Paragraph 1.

(3) Take the initial camber and caster readings before loosening the cam bolt nuts.

Camber—Left Wheel +¼° to ¾° (preferred +½°).
Right Wheel 0° to +½° (preferred +¼°).

Caster —Power Steering +¼° to 1¼°.
Manual Steering 0° to —1°.

(5) Camber settings should be held as close as possible to the "preferred" setting. Caster should be held as nearly equal as possible on both wheels.

Toe-in (3/32 to 5/32 inch) (Preferred ⅛ inch)

The toe setting should be the final operation of the front wheel alignment adjustments. The front wheels must be in a straight ahead position. Follow the equipment manufacturers procedure. The steering wheel should be centered during this operation.

Turning the tie rod sleeve will "center" the steering wheel spokes. If the steering wheel was centered, make the toe-in adjustment by turning both sleeves an equal amount. Be sure and tighten with a clamp rotated such that the bolts are on the bottom, otherwise interference with the torsion bars in jounce may result.

4. TORSION BARS

The torsion bars are **not** interchangeable side for side. The bars are marked either right or left by an "R" or an "L" stamped on one end of the bar.

Removal

(1) Remove the rebound bumper from its mounting bracket located under the upper control arm.

(2) If the vehicle is to be raised on a hoist, make sure it is lifted on the body only so that the front suspension is in full rebound (under no load). If the vehicle is to be raised on jacks, placed under the

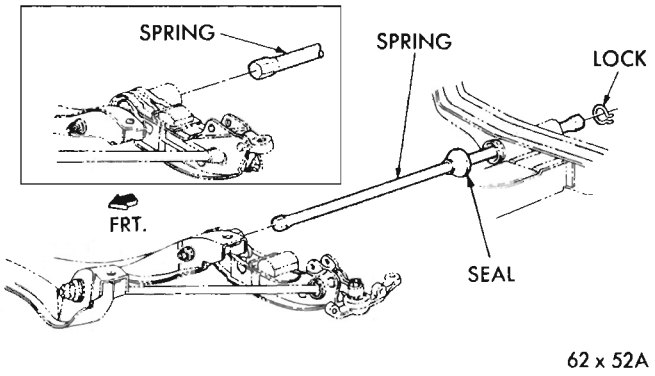


Fig. 5—Torsion Bar Spring

center of the "K" member, **it will be necessary that a support first be placed under the "K" member.**

CAUTION: Under no circumstances should the front end of the vehicle be raised with a jack unless a support is first positioned under the "K" member.

(3) Release the load from the torsion bar (Fig. 5) by backing off the anchor adjusting bolt (Fig. 6).

(4) Remove the lock ring from the rear of the torsion bar rear anchor (Fig. 5).

(5) Using Tool C-3728, remove the torsion bar (Fig. 6) from its anchors. It is advisable to place Tool C-3728 toward the rear of the torsion bar to allow sufficient room for striking the striking pad of the tool. **Do not apply heat to the torsion bar, front anchor or rear anchor.** On Valiant models equipped with the 225 cubic inch engine it may be necessary to remove the exhaust pipe from the manifold when using Tool C-3728 on the left bar.

(6) Remove the tool and slide the rear anchor balloon seal off of the anchor to facilitate removal of the torsion bar.

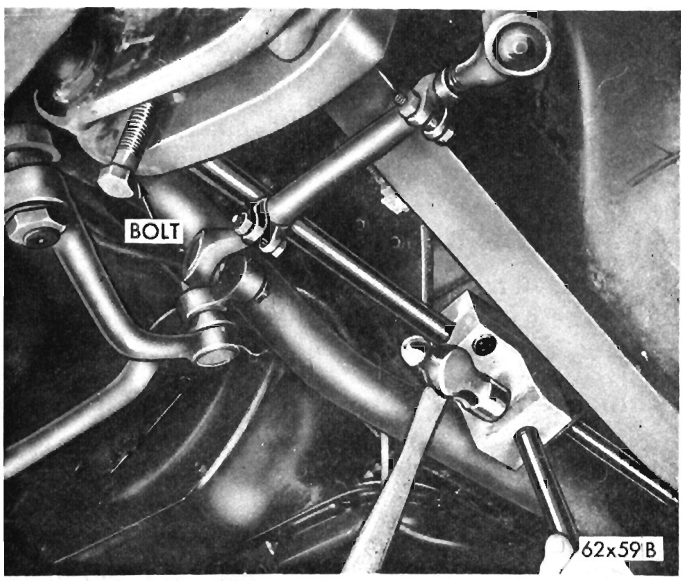


Fig. 6—Removing Torsion Bar

(7) Remove the torsion bar by sliding the bar out through the rear of the rear anchor. Use care not to damage the balloon seal when it is removed from the torsion bar.

Installation

(1) Inspect the balloon seal for damage and replace if necessary.

(2) Inspect the torsion bar for scores and nicks. Dress down all scratches and nicks to remove the sharp edges, then paint the repaired area with a good rust preventative.

(3) Remove all foreign material from the hex openings in the anchors and from the hex ends of the torsion bars.

(4) Inspect the torsion bar adjusting bolt and swivel for corrosion or other damage and if necessary replace. Lubricate for easy operation.

(5) Insert the torsion bar through the rear anchor.

(6) Slide the balloon seal over the torsion bar (cupped end toward rear of bar).

(7) Coat both hex ends of the torsion bar with MoPar Multi-Mileage Lubricant, Part Number 2298947.

(8) Slide the torsion bar into the hex opening of the lower control arm.

(9) Install the lock ring in the rear of the torsion bar rear anchor.

(10) Pack the annular opening in the rear anchor completely full of multi-purpose grease.

(11) Position the balloon seal on the rear anchor so the lip of the seal engages with the groove in the anchor.

(12) Tighten the adjusting bolt to place a load on the torsion bar.

(13) Lower the vehicle to the floor and adjust the front suspension height (Paragraph 2).

(14) Install the upper control arm rebound bumper on its mounting bracket.

5. LOWER CONTROL ARM AND SHAFT (Fig. 7)

Removal

(1) Remove the upper control arm rebound bumper.

(2) Raise the vehicle so the front suspension is in full rebound (under no load) and remove the wheel and drum assembly.

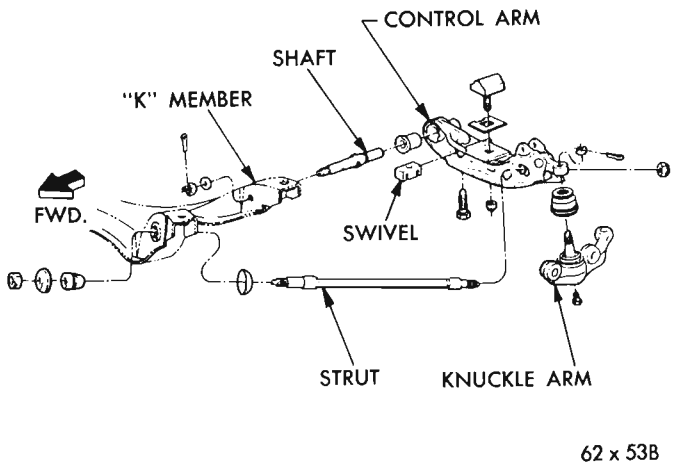


Fig. 7—Lower Control Arm Assembly

(3) Disconnect the shock absorber from the lower control arm and push it up out of the way.

(4) Remove all load from the torsion bar by backing off the adjusting bolt.

(5) Remove the torsion bar from the lower control arm (Paragraph 4).

(6) Remove the cotter pin and slide the tie rod and seal protectors up on the steering knuckle arm. Remove the tie rod end from the steering knuckle arm using Tool C-3894 (Fig. 8) **Use care not to damage the seal.**

(7) Remove the steering knuckle to brake support plate bolts and remove the steering knuckle arm. Move the brake support assembly out of the way.

(8) Remove the ball joint stud from the lower control arm using Tool C-3846 (Fig. 9).

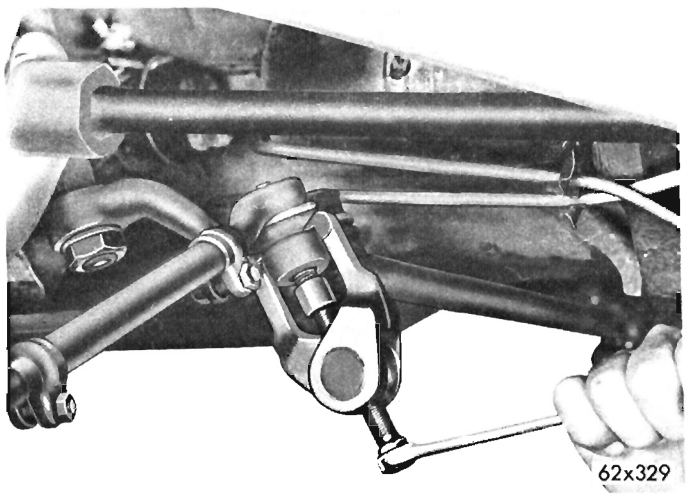


Fig. 8—Removing Tie Rod End Stud

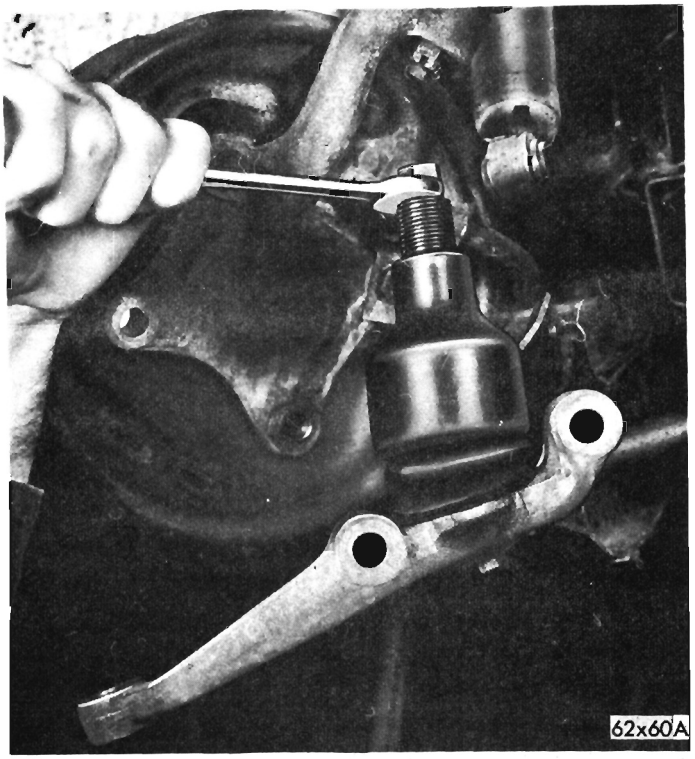


Fig. 9—Removing Lower Ball Joint Stud

(9) Remove the strut nut and bushing retainer (Fig. 7) from the forward end of the "K" member.

(10) Remove the cotter pin, nut and washer from the lower control arm shaft (Fig. 7).

(11) Tap the end of the lower control arm shaft with a "soft end" hammer to aid in removal of the shaft from the "K" member.

(12) Remove the lower control arm, shaft and strut as an assembly from the "K" member.

(13) Remove the strut rubber bushing from the "K" member only if damaged.

(14) Remove the strut bushing inner retainer from the "K" member, if it did not come out with the strut.

Disassembly

(1) Place the strut portion of the lower control arm assembly in a vise and remove the nut from the strut.

(2) Remove the strut from the lower control arm.

(3) Remove the jounce bumper from the lower control arm.

(4) Remove the torsion bar adjusting bolt and swivel.

(5) Place the lower control arm assembly in an arbor press with the torsion bar hex opening up.

(6) Place a brass drift into the hex opening and

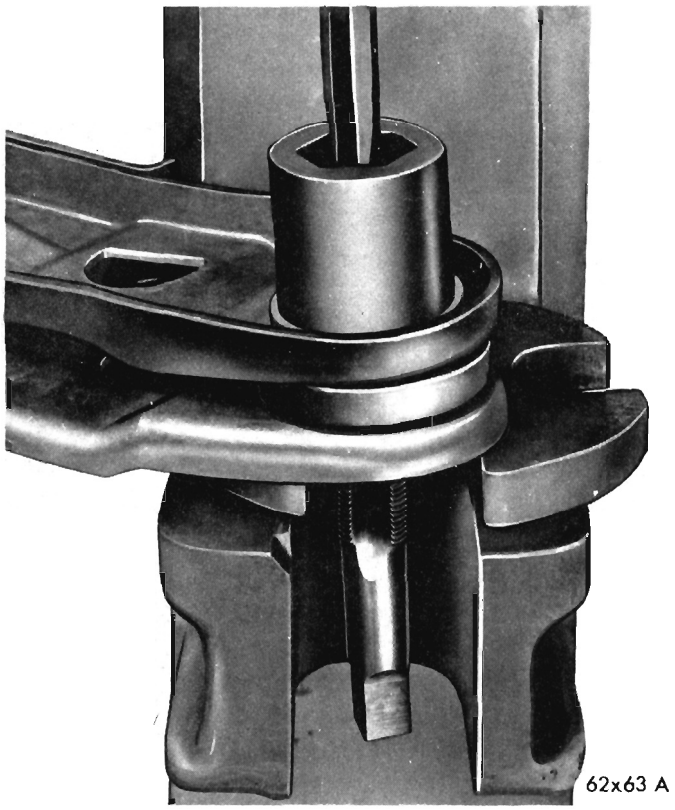


Fig. 10—Removing Bushing Shell from Control Arm

press the shaft out of the lower control arm. The bushing inner shell will remain on the shaft.

(7) Cut and remove the rubber portion of the bushing from the control arm.

(8) Insert a 1⅜ inch NF 12 tap into the pivot shaft bushing outer shell approximately one half the depth of the bushing.

(9) Using a hand press and a blunt drift, force the bushing out of the control arm (Fig. 10).

(10) Remove the bushing shell from the tap.

(11) Remove the bushing inner shell from the pivot shaft.

Assembly

(1) Position the new bushing on the shaft (flange end of bushing first) and seat bushing on the shoulder of the shaft.

(2) Press the shaft and bushing assembly into the lower control arm using Tool C-3848 and an arbor press.

(3) Install the torsion bar adjusting bolt and swivel.

(4) Install the jounce bumper on the control arm and tighten the nut 200 inch-pounds torque.

(5) Position the strut in the lower control arm and tighten the nut 110 foot-pounds torque.

Installation

(1) Install the new strut bushing if necessary (in "K" member), with a twisting motion. Water may be used as a lubricant to aid in installation.

(2) Position the lower control arm shaft and strut into their respective mountings in the "K" member. The strut bushing inner retainer should be placed over the shaft before the strut is inserted into the bushing.

(3) Install the strut bushing outer retainer and nut finger tight only.

(4) Install the lower control arm shaft washer and nut finger tight only.

(5) Position the lower ball joint stud into the lower control arm and tighten the nut 100 foot-pounds torque. Install the cotter pin.

(6) Position the brake support plate on the steering knuckle and install the two upper bolts and nuts finger tight only.

(7) Position the steering knuckle arm on the steering knuckle and install the two lower bolts and nuts.

(8) Tighten the upper bolt nuts 55 foot-pounds torque. Tighten the lower bolt nuts to 100 foot-pounds torque on Valiant and 120 foot-pounds on Plymouth.

(9) Inspect the tie rod seal for damage and replace the assembly if damaged. Connect the tie rod end of the steering knuckle arm and tighten the nut 40 foot-pounds torque. Slide the tie rod end seal protector over the tie rod end. Install the cotter pin over the outer tie rod stone shield.

(10) Connect the shock absorber to the lower control arm and tighten the nut 55 foot-pounds torque.

(11) Install the torsion bar (Paragraph 4).

(12) Install the wheel and drum assembly and adjust the front wheel bearing. (See Group 22, "Wheels, Bearings and Tires").

(13) Lower the vehicle to the floor.

(14) Tighten the strut nut, at the "K" member, 40 foot-pounds torque.

(15) Adjust the front suspension height (Paragraph 2).

(16) Tighten the lower control arm shaft nut 130 foot-pounds torque and install the cotter pin.

(17) Measure and adjust the front suspension alignment as necessary (Paragraph 3).

6. LOWER CONTROL ARM STRUT

Removal

(1) Remove the lower control arm, shaft and strut as an assembly (Paragraph 5).

(2) Remove the nut holding the strut to the lower control arm.

(3) Remove the strut from the lower control arm.

Installation

(1) Position the strut into the lower control arm and tighten the retaining nut 110 foot-pounds torque.

(2) Install the lower control arm, shaft and strut assembly, as outlined in Paragraph 5.

7. LOWER BALL JOINTS

Removal

The lower ball joint is integral with the steering arm and is not serviced separately.

(1) Remove the upper control arm rebound bumper.

(2) Raise the vehicle so the front suspension is in full rebound (under no load). If jacks are used to raise the vehicle, it is essential that a support be used between the "K" member and the jack.

(3) Remove the wheel and drum as an assembly. It may be necessary to back-off the brake shoes to facilitate removal of the drum assembly.

(4) Remove the two lower bolts from the backing plate that attach the steering arm and ball joint assembly to the steering knuckle.

(5) Remove the tie rod end from the steering arm using Tool C-3894. **Use care not to damage the seal.**

(6) Using Tool C-3846, remove the ball joint stud from the lower control arm (Fig. 9), and remove the steering arm and ball joint assembly.

Installation

NOTE: The lower ball joint seal incorporates a convex toothed retainer.

(1) Place a new seal over the ball joint (if necessary) and press the retainer portion of the seal down on the ball joint housing (using a 1⅞ inch socket) until it is securely locked in position.

(2) Position the steering arm and ball joint assembly on the steering knuckle and install the two mounting bolts. Tighten the nuts to 100 foot-pounds torque on Valiant and 120 foot-pounds torque on Plymouth.

(3) Insert the ball joint stud into the opening in the lower control arm.

(4) Install the stud retaining nut and tighten to 100 foot-pounds torque. Install the cotter pin. Remove the plug from the ball joint housing and install a grease fitting in the plug hole. Repack joint with the specified grease until seal passes grease or the seal swells showing fullness. Replace grease fitting with plug.

(5) Inspect the tie rod seal for damage and replace if damaged. Connect the tie rod end to the steering knuckle arm and tighten the nut 40 foot-pounds torque. Slide the tie rod end seal protector over the nut and install the cotter pin.

(6) Place a load on the torsion bar by turning in the adjusting bolt.

(7) Install the wheel and drum assembly.

(8) Adjust the front wheel bearing (See Group 22, "Wheels, Bearings and Tires").

(9) Lower the vehicle to the floor and install the upper control arm rebound bumper.

(10) Measure and adjust the front end height if necessary (Paragraph 2).

(11) Measure the front end alignment and adjust if necessary (Paragraph 3).

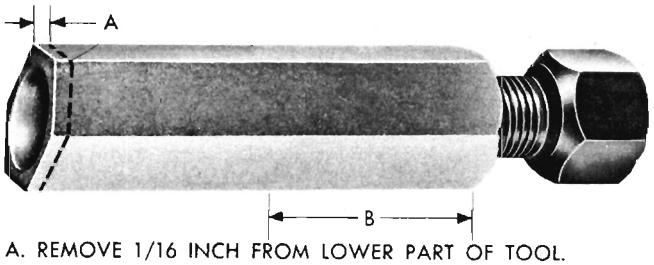
8. UPPER CONTROL ARM

Removal and Disassembly

(1) Place a jack under the lower control arm as close to the wheel as possible. Raise the vehicle until the wheel clears the floor.



Fig. 11—Removing Upper Ball Joint Stud



A. REMOVE 1/16 INCH FROM LOWER PART OF TOOL.
B. ROUND OFF PORTION OF THE TOOL THAT IS POSITIONED NEXT TO THE STEERING KNUCKLE ARM.

62 x 127

Fig. 12—Tool C-3711 Modified

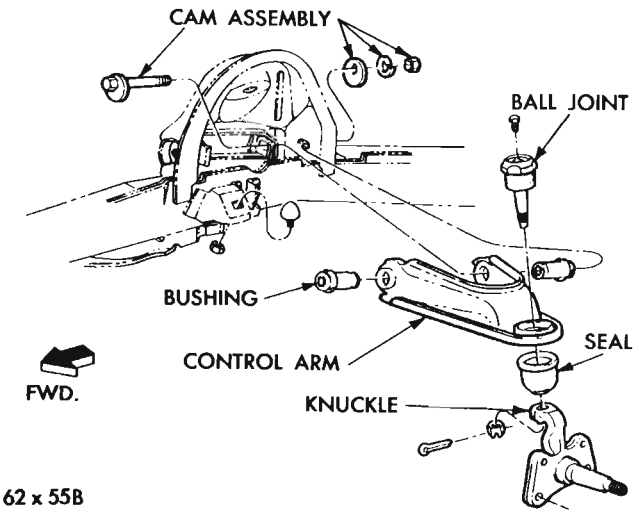
(2) Remove the wheel and tire as an assembly.

(3) Remove the upper and lower ball joint stud nuts. On Valiant models, it may be necessary to add approximately $\frac{7}{16}$ inch of flat washers over the lower ball joint stud to allow the use of Tool C-3711 without damaging the threads on the lower ball joint stud. Place Tool C-3711 over the stud. Turn the threaded portion of the tool locking it securely against the upper stud (Fig. 11).

To use Tool C-3711 as outlined, it may be necessary to modify the tool, as shown in Figure 12.

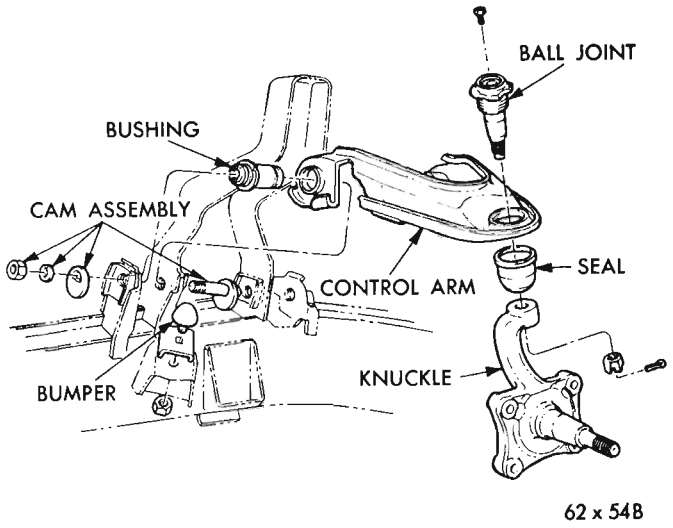
(4) Spread tool enough to place upper stud under a load, then strike the steering knuckle sharply with a hammer to loosen stud. **Do not attempt to force stud out of the steering knuckle with the tool alone.**

(5) Remove the nuts, lockwashers, cams and cam bolts that attach the upper control arm and bushings (Fig. 13 or 14) to the front and rear support brackets. Lift the upper control arm up and away from the support.



62 x 55B

Fig. 13—Upper Control Arm Assembly (Plymouth)



62 x 54B

Fig. 14—Upper Control Arm Assembly (Valiant)

(6) Remove the ball joint using Tool C-3560 (Plymouth) Tool C-3714 (Valiant) (Fig. 15). The seal will come off as the ball joint is removed.

(7) Assemble Tool C-3710 over the bushing and press the bushing out of the arm (from the inside out) (Fig. 16).

NOTE: To remove the upper control arm rear bushing support sleeve (used on Police and taxi application) assemble Tool C-3710, using adaptor SP-3828 in place of adaptor SP-3088, over the bushing and press the bushing out of the arm (Fig. 16).

Assembly

When installing new bushings, be sure the control arm is supported squarely at the point where the bushing is being pressed in. **Do not use oil or grease to aid in installation.**

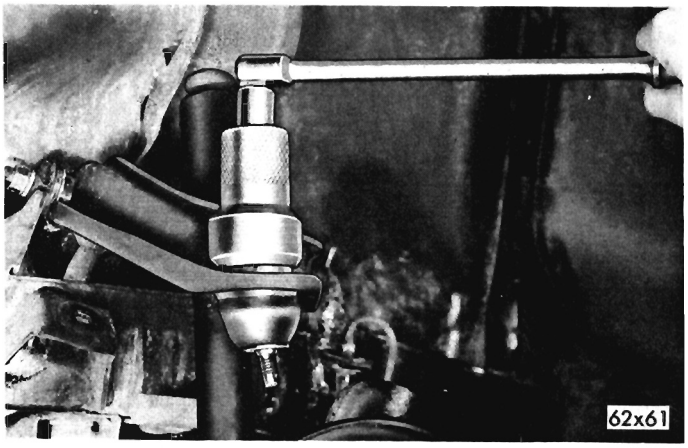


Fig. 15—Removing or Installing Upper Ball Joint

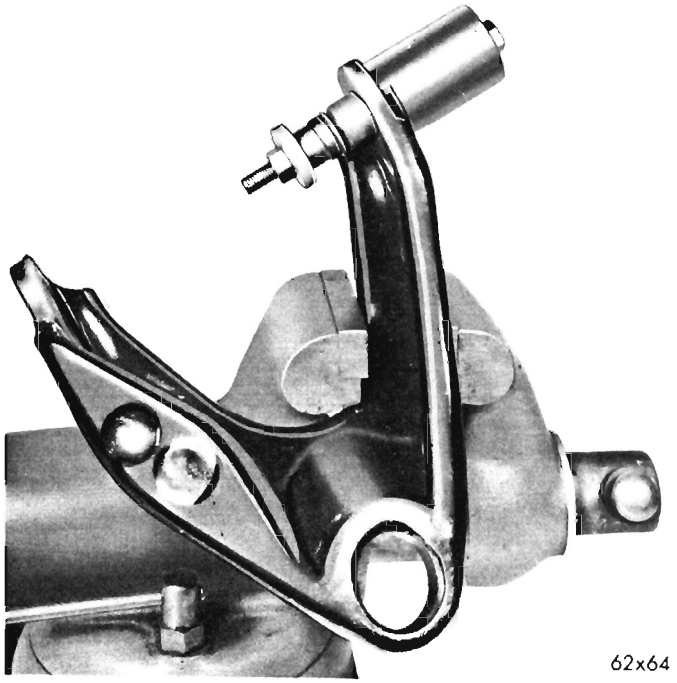


Fig. 16—Removing Upper Control Arm Bushing

(1) Position the flange end of the new bushing in Tool C-3710, support the control arm squarely, and force the bushings into the control arm (from outside) until the tapered portion of the bushing seats on the arm.

NOTE: On police and taxi application (using the bushing support sleeve) remove Tool C-3710 after the bushing has been installed and install adaptor SP-3827 in place of SP-3233A cup on the tool and install the support sleeve on the bushing (Fig. 17).

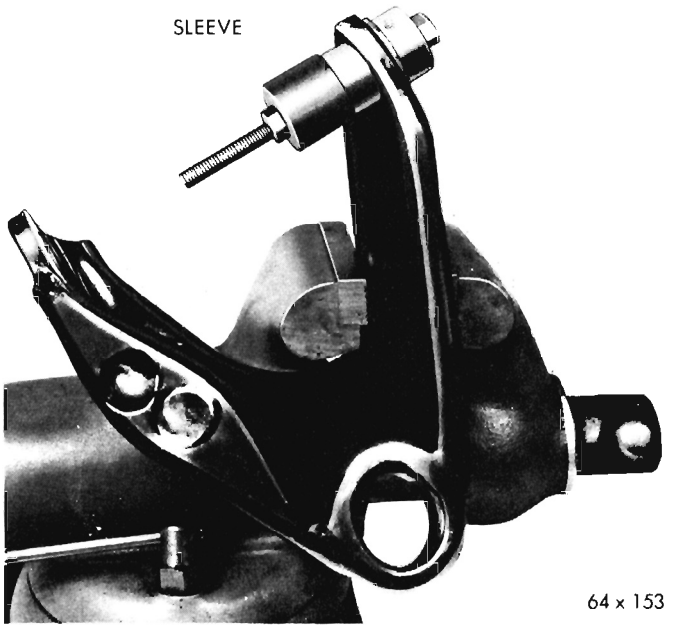


Fig. 17—Installing Upper Control Arm Bushing Support Sleeve

(2) Install the ball joint into the arm using Tool C-3560 (Plymouth) Tool C-3714 (Valiant). Tighten until seated (125 foot-pounds minimum). The ball joint will cut threads into a new arm during the tightening operations.

(3) Install a new ball joint balloon seal using Tool C-3736 or Tool SP-3307 cup and SP-3208 stud. SP-3208 stud is part of Tool C-3713 (Plymouth). On Valiant Models, use Tool C-3713.

Installation

(1) Slide the upper control arm into position and install the control arm cam bolts (Figure 13 or 14), and nuts. Tighten nuts in preparation for final adjustments.

(2) Slide the upper ball joint stud into position in steering knuckle and install nut. Tighten the nut 55 foot-pounds torque on Valiant and 100 foot-pounds torque on Plymouth and install cotter pin. Remove the plug from the ball joint housing and install a grease fitting in the plug hole. Repack the joint with the specified grease, until seal passes grease or the seal swells showing fullness. Remove the grease fitting and reinstall the plug. Tighten the lower stud nut 100 foot-pounds torque.

(3) Install the wheel and adjust the bearing (See Group 22, "Wheels, Bearings and Tires").

(4) Measure and adjust the vehicle height and alignment (Paragraphs 2 and 3).

9. UPPER BALL JOINTS

Removal

(1) Raise the vehicle by placing a jack under the lower control arm as close as possible to the wheel.

(2) Remove the wheel and drum as an assembly.

(3) Remove the upper and lower ball joint stud nuts. On Valiant models, it will be necessary to add approximately $\frac{7}{16}$ inch of flat washers over the lower ball joint stud to allow the use of Tool C-3711 without damaging the threads on the lower ball joint stud. Place Tool C-3711 over the studs. Turn the threaded portion of tool locking it securely against the upper stud (Fig. 11). To use Tool C-3711 as outlined, it will be necessary to modify it, as shown in Figure 12.

(4) Spread the tool enough to place the upper stud under a load, then strike the steering knuckle sharply with a hammer to loosen stud. **Do not attempt to force stud out of the steering knuckle with tool alone.**

(5) Remove the tool, then remove the ball joint stud from the steering knuckle.

(6) Using Tool C-3560 (Plymouth) Tool C-3714 (Valiant) unscrew the ball joint from the upper control arm (Fig. 15). The seal will come off as the ball joint is being removed.

Installation

NOTE: When installing a ball joint, it is very important that the ball joint threads engage those of the control arm squarely. Balloon type seals should always be replaced once they have been removed.

(1) Screw ball joint squarely into the control arm as far as possible by hand.

(2) Using Tool C-3560 (Plymouth) Tool C-3714 (Valiant) tighten the ball joint until it bottoms on the housing. Tighten to a minimum of 125 foot-pounds torque.

NOTE: If the ball joint cannot be torqued to 125 foot-pounds, inspect the threads on the ball joint and also in the control arm and replace the ball joint or control arms as necessary.

(3) Position a new balloon seal over the ball joint stud and install seal using Tool C-3736 or Tool SP-3307 cup and SP-3208 stud. Tool SP-3208 stud is part of Tool C-3713 (Plymouth). On Valiant models, use Tool C-3713.

(4) Position the ball joint stud in the steering knuckle and install a retaining nut.

(5) Tighten the nut 55 foot-pounds torque on Valiant and 100 foot-pounds torque on Plymouth and install the cotter pin. Remove the plug from the ball joint housing and install a grease fitting. Repack the joint with the specified grease until grease passes through seal or the seal swells showing fullness.

(6) Install the lower ball joint stud nut and tighten the 100 foot-pounds torque. Install the cotter pin.

(7) Install the wheel and drum assembly.

(8) Adjust the front wheel bearings (See Group 22, "Wheels, Bearing and Tires").

(9) Lower the vehicle and adjust the front suspension height as necessary (Paragraph 2).

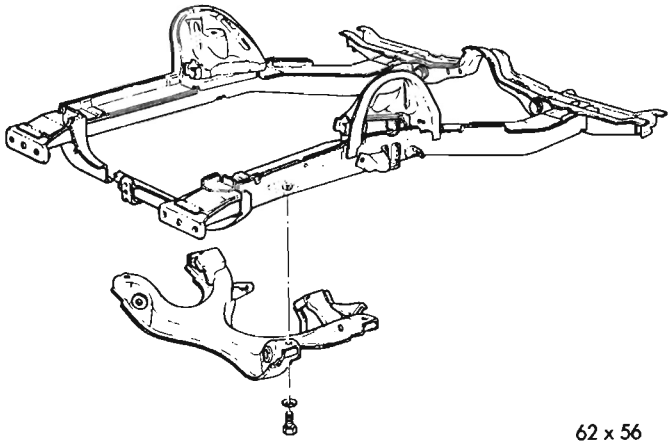
10. SWAY BAR (if so equipped)

Removal

(1) Remove the two sway bar link retaining nuts and washers.

(2) Remove the two sway bar cushion retaining nuts, washers, and bolts (one to each strut) and remove the sway bar assembly.

(3) Remove the sway bar link insulating bushings from the frame bracket. If the bushings are worn or deteriorated install new bushings.



62 x 56

Fig. 18—"K" Member (Plymouth)

Installation

(1) Using a twisting motion, install the sway bar link bushings. Water may be used as a lubricant to aid in installation.

(2) Position the sway bar cushion housings on the struts and install the lock plates.

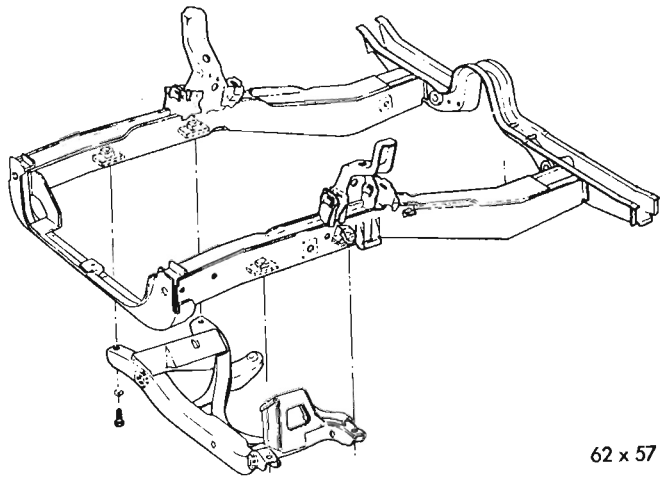
(3) Insert the bolts, washers and nuts and tighten to 35 foot-pounds torque.

(4) Install the washers over the ends of the links (concave side up). Slide the links up through the bushings and install the washers (concave side down). Install the nuts and tighten to 100 inch-pounds torque.

11. FRONT SUSPENSION "K" MEMBER (Figures 18 and 19)

Removal

(1) Remove the engine mount to "K" member mounting bolts.



62 x 57

Fig. 19—"K" Member (Valiant)

(2) Remove the carburetor air cleaner.

(3) Attach engine lifting plate, Tool C-3804 to the cylinder head on vehicles equipped with 6 cylinder engines. Position engine lifting fixture Tool C-3809 over the engine and attach the fixture to the lifting plate. Raise the engine until the motor mounts clear the "K" member.

(4) On vehicles equipped with 8 cylinder engines, remove the carburetor and install engine holding fixture Tool C-3466 to support the engine while the "K" member is being removed.

(5) Remove the lower control arm assemblies, both sides (Paragraph 5).

(6) Remove the idler arm at the "K" member mounting.

(7) Disconnect the steering gear from the "K" member and support it to relieve all tension.

(8) Install frame stands under the body side rails.

(9) Remove the "K" member mounting bolts and remove the "K" member.

(10) Remove the strut bushings from the "K" member.

Installation

(1) Install the lower control arm strut bushings into the "K" member using only water as a lubricant.

(2) Position the "K" member on the body side rails, install the four mounting bolts. Tighten the bolts 150 foot-pounds torque.

(3) Lower the engine and install the engine mounting bolts and tighten to 85 foot-pounds torque.

(4) Position the steering gear on the "K" member and install the mounting bolts and washers. Tighten bolts 50 foot-pounds torque.

(5) Connect the idler arm to its mounting bracket and tighten the nut 45 foot-pounds torque. Install the cotter pin.

(6) Install the lower control arms, shafts and strut assemblies (Paragraph 5). (Do not tighten.)

(7) Remove the engine lifting fixture and plate and install the carburetor if removed.

(8) Install the carburetor air cleaner.

(9) Measure and adjust the front suspension height if necessary (Paragraph 2). Tighten the pivot shaft to "K" member nuts and insert cotter pins. Tighten the strut nuts (front - 40 foot-pounds) (rear - 110 foot-pounds).

(10) Measure and adjust the front suspension alignment, Paragraph 3 (if necessary).

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
Front End Noise	(a) Ball joint needs lubrication.	(a) Lubricate ball joint (see Lubrication Group "O").
	(b) Shock absorber or bushings.	(b) Replace bushings.
	(c) Worn strut bushings.	(c) Replace bushing.
	(d) Loose struts—Lower control arm bolts and nuts.	(d) Tighten all bolts and nuts.
	(e) Loose steering gear on frame.	(e) Tighten the steering gear mounting bolts.
	(f) Worn upper control arm bushings.	(f) Replace the worn bushings.
	(g) Worn lower control arm shaft bushings.	(g) Replace the worn bushings.
	(h) Excessively worn upper ball joint.	(h) Replace the ball joint.
	(i) Excessively worn lower ball joint.	(i) Replace the ball joint.
	(j) Worn tie rod ends.	(j) Replace the tie rod end.
	(k) Loose or worn front wheel bearings.	(k) Adjust or replace the bearings as necessary.

SERVICE DIAGNOSIS—(Continued)

Condition	Possible Cause	Correction
Poor Directional Stability	(a) Low or uneven tire pressure.	(a) Inflate the tires to correct pressure.
	(b) Loose wheel bearings.	(b) Adjust the wheel bearing.
	(c) Improper steering cross shaft adjustment.	(c) Adjust the steering cross shaft.
	(d) Steering gear not centered.	(d) Adjust the steering gear.
	(e) Worn idler arm bushing.	(e) Replace the bushing.
	(f) Loose or failed front strut bushings.	(f) Replace the bushings.
	(g) Weak or broken rear spring.	(g) Replace the spring.
	(h) Incorrect front suspension alignment or heights.	(h) Measure and adjust the front end alignment and heights.
	(i) Shock absorber inoperative.	(i) Replace the shock absorber.
Hard Steering	(a) Ball joints—insufficient lubrication.	(a) Lubricate the ball joints.
	(b) Low or uneven tire pressure.	(b) Inflate the tires to the recommended pressures.
	(c) Low power steering fluid level. (On Power Steering equipped vehicles).	(c) Fill the power steering pump reservoir to level with MoPar Power Steering fluid.
	(d) Lack of assist of power steering system.	(d) Inspect and test the power steering pump and steering gear. Service the power steering pump or gear as required.
	(e) Low front suspension height.	(e) Adjust heights to specifications.
	(f) Incorrect front end alignment (particularly caster) resulting from one of the following: (a) Upper control arm bent. (b) Lower control arm bent. (c) Steering knuckle or steering knuckle arm bent.	(f) Replace the bent part, and align suspension.
	(g) Steering gear low on lubricant.	(g) Fill the steering gear to the correct level.
	(h) Steering gear not adjusted properly.	(h) Adjust the steering gear.
	(i) Idler arm binding.	(i) Free-up the idler arm.
Excessive Play in Steering	(a) Worn or loose front wheel bearings.	(a) Adjust or replace the wheel bearings as necessary.
	(b) Incorrect steering gear adjustment.	(b) Adjust the steering gear.
	(c) Loose steering gear to frame mounting bolts.	(c) Tighten the steering gear to frame bolts.
	(d) Worn tie rod ends.	(d) Replace the tie rods as necessary.
	(e) Worn steering gear parts.	(e) Replace worn steering gear parts and adjust steering gear as necessary.
	(f) Worn upper control arm ball joints.	(f) Replace the ball joints.

SERVICE DIAGNOSIS—(Continued)

Condition	Possible Cause	Correction
	(g) Worn lower control arm ball joints.	(g) Replace the ball joints.
	(h) Worn idler arm bushings.	(h) Replace the bushing.
Front Wheel Shimmy	(a) Tire, wheel out of balance.	(a) Balance the wheel and tire assembly.
	(b) Uneven tire wear, or extremely worn tires.	(b) Rotate or replace the tires as necessary.
	(c) Worn or loose wheel bearings.	(c) Replace or adjust the wheel bearings as necessary.
	(d) Worn tie rod ends.	(d) Replace the tie rod ends.
	(e) Strut mounting bushings loose or worn.	(e) Replace the strut mounting bushings.
	(f) Incorrect front end alignment and car height (particularly caster).	(f) Adjust the front end alignment and car height.
Vehicle Pulls to One Side	(a) Low or uneven tire pressure.	(a) Inflate the tires to the recommended pressure.
	(b) Front brake dragging.	(b) Adjust the brakes.
	(c) Grease, lubricant or brake fluid leaking onto brake lining.	(c) Replace brake shoe and lining as necessary and eliminate all leaks.
	(d) Loose strut bushings.	(d) Adjust or replace the strut bushings.
	(e) Power steering control valve out of adjustment.	(e) Adjust the steering gear control valve.
	(f) Incorrect front end alignment (particularly caster).	(f) Adjust the front end alignment.
	(g) Broken or sagging front or rear spring.	(g) Replace the spring as necessary.
	(h) Failed suspension pivot bushings.	(h) Replace the bushings as necessary.

GROUP 3
REAR AXLE

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VALIANT

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SURE-GRIP DIFFERENTIAL

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SPECIFICATIONS

PLYMOUTH MODELS VP-1, VP-2

TYPE	
Gear Type	Semi-Floating Hypoid
Ring Gear Diameter	(6-Cyl.) 8.25 inch (8-Cyl.) 8.75 inch
PINION BEARINGS	
Type	Tapered Roller
Number Used	2
Adjustment	Select Shims
Pre-Load Torque (Seal Removed)	20 to 30 inch-pounds
DIFFERENTIAL BEARINGS	
Type	Tapered Roller
Number Used	2
Adjustment	Adjusting Nut

SPECIFICATIONS—(Continued)

RING GEAR AND PINION	
Serviced in	Matched Sets
Ring Gear Runout	.005" Max.
Adjustment	Select Washers
Back Lash	.006 to .008"
DIFFERENTIAL SIDE GEAR CLEARANCE	
With Gauge	.001 to .012"
WHEEL BEARINGS	
Type	Tapered Roller
Adjustment	Select Shims
End Play	.013 to .023
LUBRICATION	
Capacity	4 Pints
Type	Multi-purpose Gear Lubricant as defined by MIL-L-2105B is used in all rear axles. MoPar Hypoid Lubricant Part No. 1879414 is also recommended.

Anticipated Temperature Range	Viscosity Grade
Above −10°F	SAE 90
As low as −30°F	SAE 80
Below −30°F	SAE 75

SPECIFICATIONS
VALIANT MODEL VV-1

Type	Semi-Floating Hypoid
Number of Differential Pinions	2
Axle Ratio	
Manual Transmission	Standard—3.55 Optional—3.23
Automatic Transmission	Standard—3.23 Optional—3.55
Differential Bearings	
Adjustment by	Spacer Washer .254-.284 inch in .002 inch graduations
Carrier Bearing Preload Spread	.003-.006
Lubrication	
Capacity	2 Pints
Type	Lubricants Designated for API Service GL-4 as defined by MIL-L-2105A
SAE Viscosity	Summer—Above −10° SAE 90 Winter—Below −10°F. SAE 80 Extreme Cold—Below −30°F. SAE 75
Pinion and Drive Gear Back Lash	.004-.007" at point of minimum back lash
Pinion Bearing Preload Adjustment by	Spacer Washers .074-.106 inch in .001 variations
Pinion Bearing Drag Torque	15-25 inch-pounds
Pinion Depth of Mesh Adjustment by	Spacer Washers .084-.100 inch in .002 inch graduations
Runout-Case and Drive Gear	.005 inch Maximum
Wheel Bearing Type	Single Row Sealed Ball

AXLE RATIOS

	Plymouth VP-1 225 Cu. In. Engine	Plymouth VP-2 318 Cu. In. Engine	Plymouth VP-2 361 Cu. In. Engine
PASSENGER CAR			
Manual Transmission	3.23	3.23	3.23
Optional	3.55	3.55	3.55
Automatic Transmission	2.93	2.76	2.76
Optional	3.31-3.55	2.93-3.23	2.93-3.23
Sure Grip*	3.23	2.76	2.76

	Plymouth VP-1 170 Cu. In. Engine	Plymouth VP-2 225 Cu. In. Engine	Plymouth VP-2 318 Cu. In. Engine
TAXI**			
Manual Transmission	3.91	3.55	3.55
Optional	3.55	3.91	—
Automatic Transmission	3.55	2.93	2.93
Optional	—	3.55	—
Sure Grip*	—	—	—

	Plymouth VP-1 170 Cu. In. Engine	Plymouth VP-1 225 Cu. In. Engine	Plymouth VP-2 318 Cu. In. Engine	Plymouth VP-2 361 Cu. In. Engine
POLICE**				
Manual Transmission	3.91	3.55	3.23	3.23
Optional	3.55	3.23	3.55	3.55
Sure Grip*	—	3.23	3.23	3.23
Automatic Transmission	3.55	3.23	3.23	3.23
Optional	—	2.93	2.93	2.93
	—	3.55	—	—
Sure Grip*	—	3.23	3.23	3.23

*8¾ inch Ring Gear—Standard on Sure Grip Axles

**8¾ inch Ring Gear—Standard on Taxi & Police Cars

SPECIAL TOOLS—PLYMOUTH

C-293	Axle, Pinion and Differential Case Roller Bearing Puller Set
C-406-A	Differential Bearing Adjusting Wrenches
C-413	Rear Axle Shaft Outer Bearing Cup Driver
C-430	Dial Indicator
C-496	Pinion and Transmission Companion Flange or Yoke Puller
C-499	Axle Shaft Puller
C-637	Axle Shaft and Inner Oil Seal Puller
C-685	Inch-Pounds Torque Wrench
C-745	Rear Axle Shaft Oil Seal Installing Sleeve
C-758	Pinion Setting Gauge Set
C-839	Rear Axle Shaft Inner Oil Seal Driver
C-3281	Companion Flange Holding Wrench
C-3339	Dial Indicator
C-3565	Axle Shaft Outer Seal Driver
C-3656	Pinion Oil Seal Driver
DD-996	Pinion Bearing Installer
DD-999	Flange or Yoke Installer
DD-1005	Differential Case Side and Cross Shaft Roller Bearing Driver
DD-1014	Repair Stand—Differential Carrier
SP-3639	Spacer—Part of Gauge Tool C-758-D3

SPECIAL TOOLS—VALIANT

C-293	Bearing Removing and Installing Kit
No. 39	Carrier Bearing Plates
No. 40	Pinion Bearing Plates
C-452	Pinion Yoke Remover
C-485	Heavy Duty Foot-Pound Torque Wrench
C-685	Inch-Pound Torque Wrench
C-748	Pinion Oil Seal Remover
C-3281	Pinion Yoke Holding Tool
C-3288	Pilot Stud
C-3339	Dial Indicator
C-3715	Pinion Setting Gauge Kit
C-3716	Differential Side Bearing Driver
C-3717	Pinion Bearing Installer
C-3718	Pinion Yoke Installing Tool
C-3719	Pinion Oil Seal Installer
C-3721	Housing Spreader
C-3725	Axle Shaft and Bearing Remover and Installer
C-3734	Axle Shaft Inner Oil Seal Driver

TORQUE REFERENCE

PLYMOUTH MODELS	Foot-Pounds
Axle Shaft Nuts	145 (Min.)
Brake Support Plate to Housing Mounting Bolt Nuts	30 to 35
Differential Carrier to Axle Housing Bolt Nuts	45
Rear Axle Drive Gear to Case Bolts	60
Differential Bearing Cap Bolts	90
Rear Axle Drive Pinion Companion Flange Nut	240 (Min.)
Rear Spring "U" Bolt Nuts	50
VALIANT MODELS	
Axle Shaft Retainer Nuts	35
Differential Bearing Bolts	40
Wheel Stud Nuts	55
Carrier Cover Bolts	20
Pinion Yoke Nut	240 (Min.)
Propeller Shaft Bolts—Front	32
Rear	15
Drive Gear Bolts (Left Hand Thread)	55
Spring Clip (U Bolts) Nuts	45 (Max.)

REAR AXLE

PLYMOUTH MODELS VP-1, VP-2

The rear axle assembly, shown in Figure 1, may be divided into four subassemblies; axle drive shafts with related parts, differential with drive gear, drive pinion with carrier, and axle housing. It is not necessary to remove the entire assembly to service any of the above parts with the exception of the axle housing itself. Conventional methods are used for relieving the weight of the new unitized body from the rear axle.

Gear ratio identification numbers are stamped on the front face of the pad at the bottom of the carrier. Refer to Page 21 for Valiant Models Rear Axle service procedures.

SERVICE PROCEDURES

1. REMOVING THE REAR AXLE ASSEMBLY

Should it become necessary to remove the rear axle for overhaul or repair, refer to Figure 1, then proceed as follows:

(1) Raise the rear of the vehicle until the rear wheels clear the floor. Support the body at the front of the rear springs.

(2) Block the brake pedal in the "Up" position.

(3) Remove the rear wheels.

(4) Disconnect the hydraulic flexible line.

(5) Disconnect the parking brake cable support at the transmission.

(6) Disconnect the propeller shaft at the differential yoke.

(7) Remove the rear spring (U Bolts) and the shock absorbers.

(8) Remove the axle assembly from the vehicle.

2. AXLE SHAFT

Removal

(1) Clean the axle shafts, bearings, cups, shims and hub and drum assembly using puller Tool C-845.

(2) Block the brake pedal to prevent its being depressed and disconnect the brake lines at the wheel cylinders.

(3) Remove the axle drive shaft key and remove the brake support plate assembly using Tool C-745 to protect the outer seal.

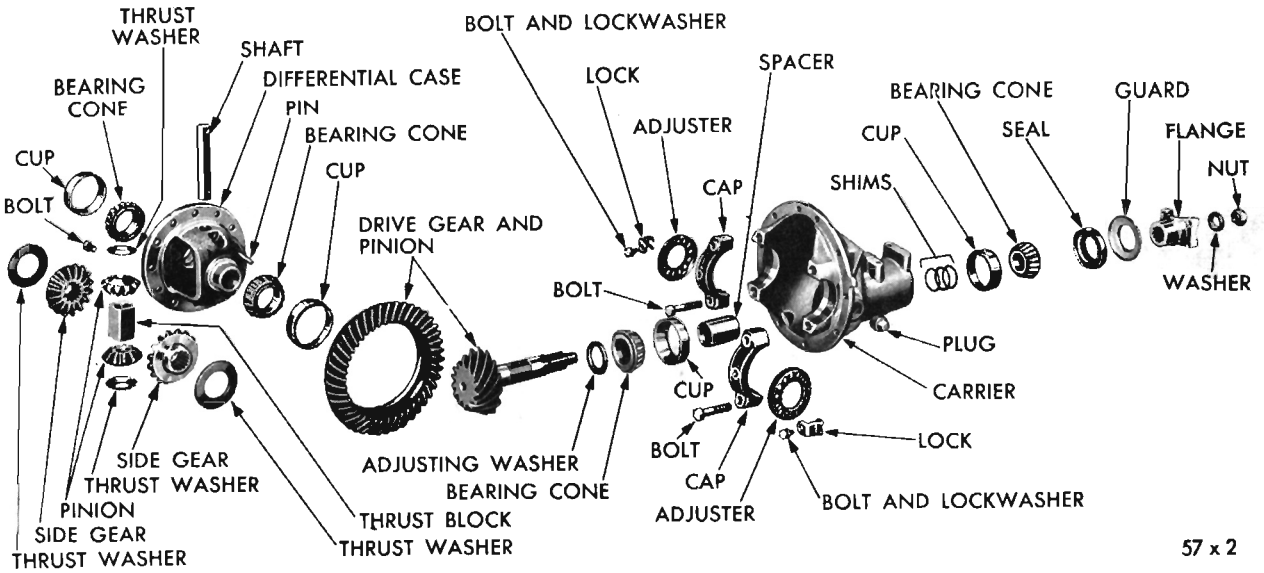


Fig. 1—Rear Axle (Pinion with Spacer)

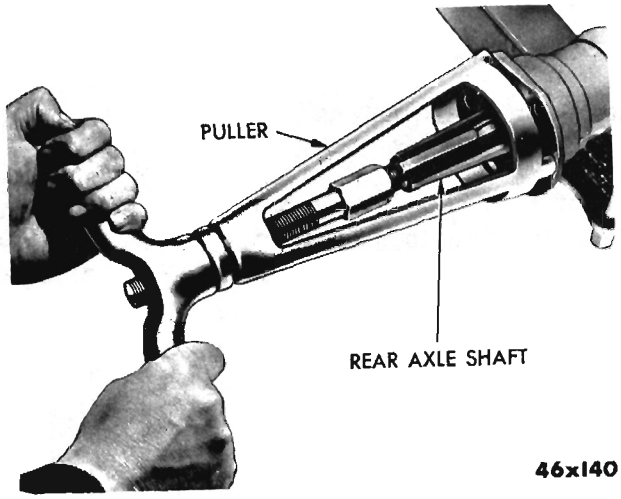


Fig. 2—Removing Axle Drive Shaft and Bearing

(4) Carefully remove the shim pack from each end of the axle housing. Identify each shim pack as to location, to aid in reassembly.

(5) Remove the axle shaft and bearing assembly with Tool C-499, as shown in Figure 2. If necessary the bearing may be removed from the axle shafts with the bearing puller Tool C-293-13, as shown in Figure 3.

(6) Remove the axle shaft inner oil seals with puller Tool C-637. Remove the brake support plate.

Cleaning and Inspection

(1) Clean the axle shafts, bearings, cups, shims and shim contacting surfaces as well as the counterbores of the axle housing, with mineral spirits or dry cleaning solvent. With the exception of the bearings, dry all the parts with compressed air.

(2) Inspect the bearing cones and cups for pitting, spalling or other visible damage. If either the bearing cone or cup is unfit for further service, always replace both.

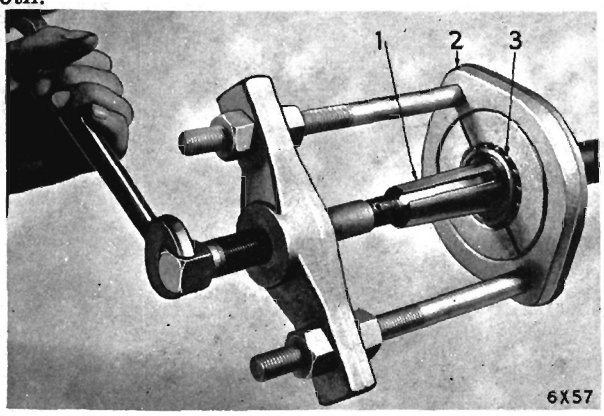


Fig. 3—Removing Bearing from Axle Drive Shaft
1—Axle Drive Shaft 2—Tool 3—Bearing

(3) Inspect each axle shaft for signs of fatigue, worn or scored oil seal contacting surfaces, wear or accumulated metal deposits on the thrust block end of shaft, damaged threads, or excessively worn splines. Machine surfaces can usually be satisfactorily cleaned. If abnormal conditions are noted, the shafts should be replaced.

(4) Inspect the shims for distortion or other visible damage. Discard any shims unfit for further service.

(5) Inspect the shim contacting surfaces of both the brake support and axle housing for burrs. Remove the burrs with crocus cloth if possible.

(6) If the inspection reveals that replacement of either the axle shafts or bearings were necessary, install new bearings on either the original shaft or the new shaft if such is being used.

Make certain the bearing and axle shaft contacting surfaces are thoroughly cleaned so the bearing when installed bottoms against the shoulder of the axle shaft **(tapered portion of bearing must face axle shaft threads).**

Axle Drive Shaft End Play

Where the original axle shafts and/or bearings are used, start the adjustment of the axle end play with the original shim pack.

(1) Install a new axle shaft inner oil seal (Fig. 4).

(2) Lubricate both axle shaft bearings and install axles and bearing cups. (Fig. 5)

(3) With the axle assembled and the brake support plates removed, proceed as follows.

(4) Push both axle shafts and bearing cups in toward the center of the housing as far as they will go.

NOTE: Rotate axles to insure seating of both bearings and cups.

(5) After pushing the left axle in as far as it will go, measure the amount the right axle shaft bearing cup protrudes out of the axle housing (using feeler gauge stock).

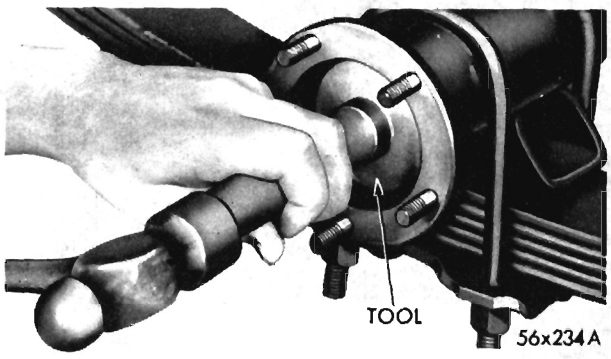


Fig. 4—Installing Axle Shaft Inner Oil Seal

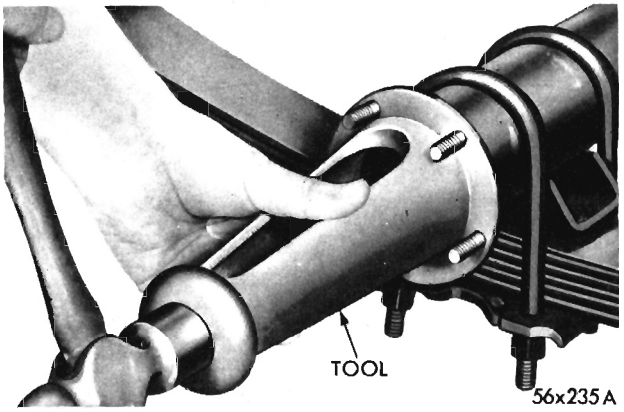


Fig. 5—Installing Axle Drive Shaft Bearing Cup

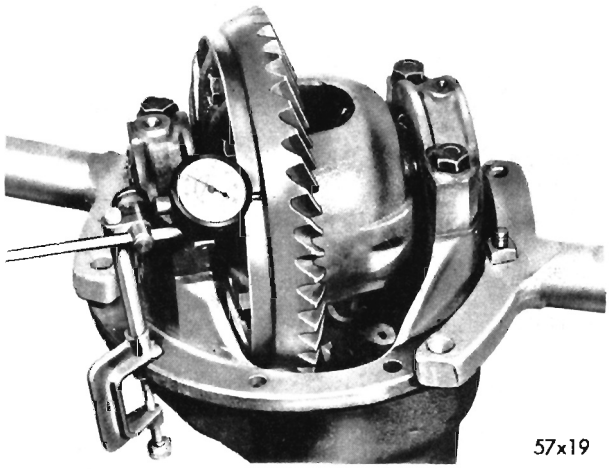


Fig. 6—Checking Drive Gear Run-Out

(6) If the protrusion of the right bearing cup is less than .052 inch (Standard Differential) or .081 inch (Sure-Grip Differential), no shims are needed on the right side. If the protrusion is beyond the above specifications, that is the amount of shims to add to the right side.

(7) Install the gasket, shims and brake support plate to the right side of the axle housing. Tighten the attaching nuts to 30-35 foot-pounds torque.

(8) Push the left axle shaft and bearing cup in as far as possible while rotating the axle shaft to insure seating of the axle bearing and cup.

(9) Measure the distance the bearing cup protrudes beyond the housing face.

(10) Add .016 inch to this measurement in order to insure proper end play.

(11) Install the gasket, shims and brake support plate. Tighten the brake plate attaching nuts to 30-35 foot-pounds of torque.

(12) Measure both axle shaft end play after assembly. Preferred end play (.013 to .023 inch). If necessary to correct, change shims on the left side.

3. DIFFERENTIAL—REMOVAL AND DISASSEMBLY

(1) Remove the axle drive shafts, Paragraph 2.

(2) Disconnect the rear universal joint and drop the propeller shaft.

(3) Remove the lubricant from the axle housing, using a suction gun.

(4) Remove the attaching nuts and lift the rear axle carrier assembly from the axle housing.

(5) Mount the differential in stand DD-1014 and secure the dial indicator Tool C-430 to the differential carrier flange so the pointer of the indicator squarely contacts the back face of the drive gear, as shown in Figure 6. Make certain there is no end play in the differential side bearings. If the end play is evident, remove the adjuster lock and slightly loosen the bearing cap on the gear tooth side. Tighten the adjuster sufficiently to eliminate the end play.

(6) Rotate the drive gear several complete revolutions while noting the total indicator reading. This reading must not exceed .005 inch runout. If the indicator reading exceeds the .005 inch runout, it will be necessary to take a second reading after the drive gear has been removed. This operation is covered during the differential disassembly.

(7) With the companion flange up, hold the flange with holding Tool C-3281 and remove the pinion shaft nut and belleville washer.

(8) Install the companion flange puller Tool C-542 and remove the flange, as shown in Figure 7.

(9) Install oil seal puller Tool C-748 by screwing it securely into the pinion oil seal, as shown in Figure 8. Tighten the puller screw to remove the seal.

(10) While holding one hand over the companion flange end of carrier, invert the carrier in the stand. The oil slinger, front bearing cone shim pack and

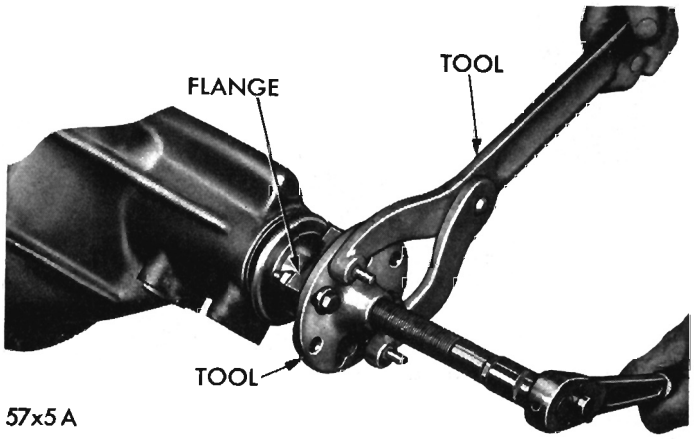


Fig. 7—Removing Companion Flange

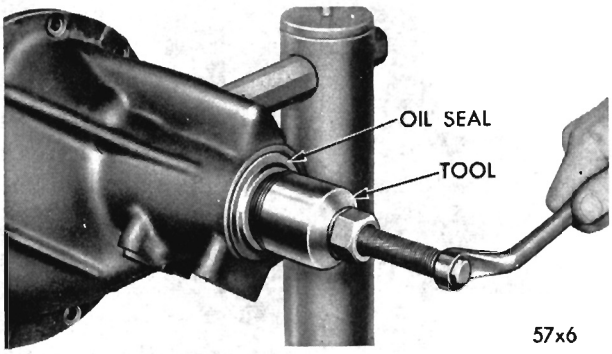


Fig. 8—Removing Pinion Bearing Oil Seal

bearing spacer (where used) will drop from the carrier.

(11) Apply identifying punch marks on the bearing supports of the differential carrier, differential bearing caps, and bearing adjusters for reassembly purposes, as shown in Figure 9.

(12) Remove each of the differential bearing adjuster lock screws and locks.

(13) With a ¾ inch socket wrench, loosen the bearing cap bolt (one each side) and back off the bearing adjusters slightly with spanner wrench Tool C-406, to remove the differential case bearing preload. Remove the bearing cap bolts, caps and bearing adjusters.

(14) Remove the differential assembly with bearing cups. Make certain that each bearing cup remains with its respective bearing.

(15) Withdraw the pinion and rear bearing cone from the carrier.

(16) With puller Tool C-293 and four No. 36 adaptor plates, remove the rear bearing cone from the pinion shaft, as shown in Figure 10. Remove the pinion locating washer.

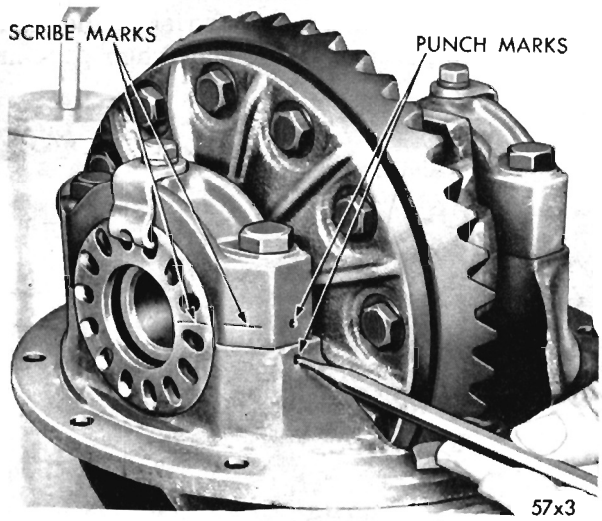


Fig. 9—Marking Bearing Caps and Adjusting Nuts

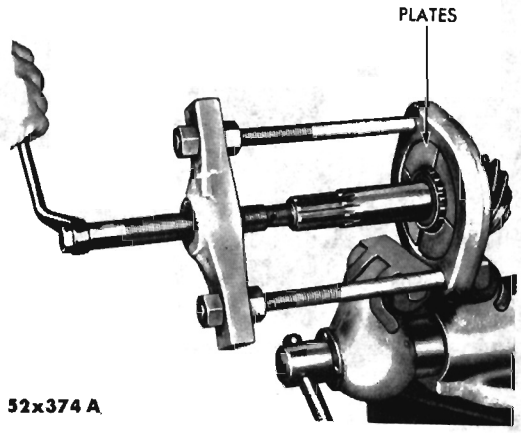


Fig. 10—Removing Bearing from Pinion Shaft

(17) The bearing cups can be removed from the carrier with a blunt brass drift and hammer.

Differential Case Disassembly

(1) Secure the drive gear in an upright position using brass jaws in a vise. With a ⅝ inch socket wrench, remove the drive gear to differential attaching cap screws. **The drive gear attaching screws have left hand threads; turn clockwise to loosen.**

(2) Remove the assembly from the vise and with a fibre mallet, tap the drive gear off the case.

(3) If the drive gear runout was found to be more than .005 inch, test the case as follows: Install the differential with bearing cups in the carrier.

(4) Install the bearing caps, attaching bolts and bearing adjusters. Snug the bearing cap bolts down lightly and screw in both adjusters with spanner wrench Tool C-406A.

(5) Tighten the support cap bolts and adjusters

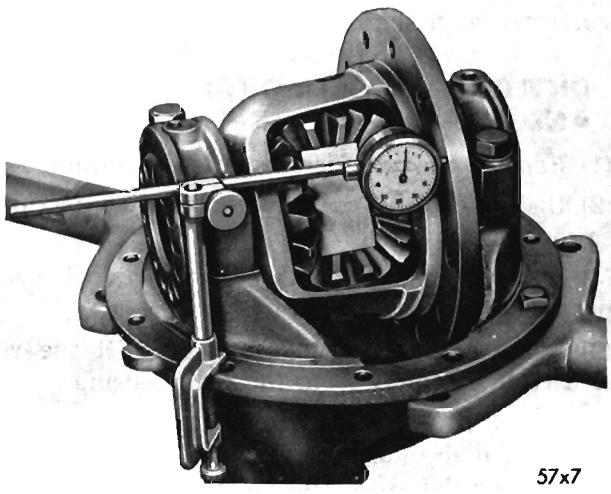


Fig. 11—Checking Drive Gear Flange Run-Out

sufficiently to prevent any end play in the bearings.

(6) Secure dial indicator Tool C-430 or C-3339 to the differential carrier flange so pointer of indicator squarely contacts the drive gear surface of the differential case flange between the outer edge of the flange and the drive gear bolt holes, as shown in Figure 11.

(7) Rotate the differential several complete revolutions while noting the total indicator reading. This reading must not exceed .003 inch runout. If the runout is in excess of .003 inch, the differential case must be replaced.

(8) Measure the side gear clearances between the gear and the case, as shown in Figure 12. Clearances should be from .001 to .012 inch. If the clearance exceeds .012 inch, install new thrust washers.

(9) From the back side of the drive gear flange, (8¾ inch gear) drive the differential pinion shaft lock pin out of the case with a flat nose drift and hammer. (On the 8¼ inch gear, the lock pin is driven out from the opposite side.) The lock pin is a ¼ inch hollow split type pin. (The hole is reamed only part way through, making it necessary to remove the lock pin from one direction.)

(10) Drive the pinion shaft out with a brass drift and remove the axle drive shaft thrust block.

(11) Rotate one differential side gear until each pinion appears at the large opening of the case. Remove each pinion and thrust washer at that time.

(12) Remove the two differential side gears and the thrust washers.

4. CLEANING AND INSPECTION

(1) Clean all parts in fast evaporating mineral spirits or a dry cleaning solvent and with the exception of the bearings, dry with compressed air.

(2) Inspect the differential bearing cones and cups for pitting or other visible damage. If replacement is necessary, remove the bearings from the differential case with puller Tool C-293-F2 and adaptor plates No. 18, as shown in Figure 13.

(3) Inspect the differential case for elongated or enlarged pinion shaft holes and the side gear counterbores and the four thrust washer contacting surfaces for galling, metal deposits or raised portions of metal. If any of the above conditions exist, satisfactory correction must be made or the case replaced. Inspect the case for cracks or other visible damage which might render it unfit for further service.

(4) Inspect the differential pinion shaft for excessive wear. Replace as necessary.

(5) Inspect the differential pinion gears for excessive wear, cracks, chipped teeth or other visible damage. Replace the pinion gears or thrust washers as necessary.

(6) Inspect the differential side gears for cracks, chipped teeth or other visible damage. Replace the differential side gears or thrust washers as necessary.

(7) Inspect the axle shaft thrust block for excessive wear or other visible damage. **The thrust block is usually damaged by using a "knock off" type axle**

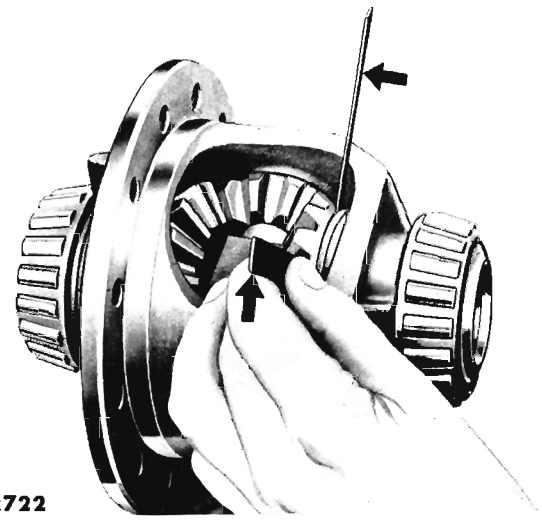


Fig. 12—Checking Differential Gear Clearance

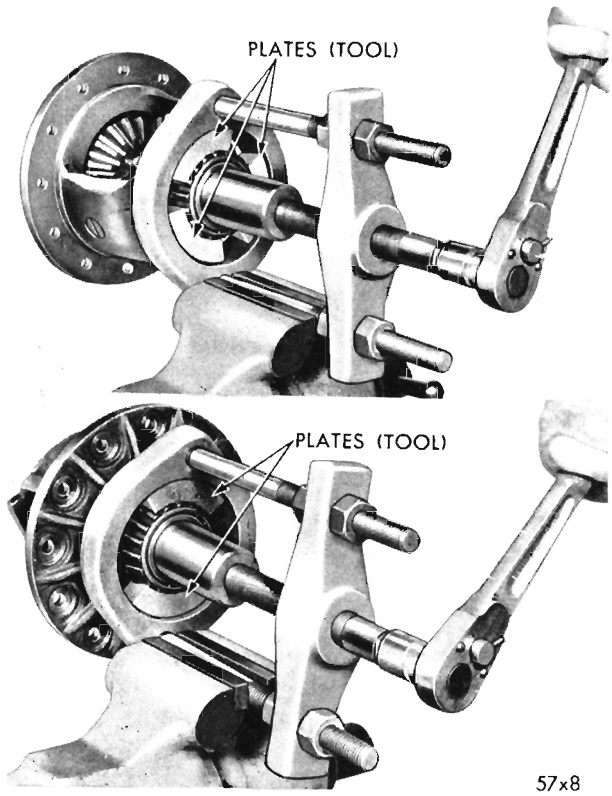


Fig. 13—Removing Differential Bearings

drive shaft remover. The wear surface, on opposite sides of the block, must be smooth. If inspection reveals that replacement of the thrust block is necessary, the axle shaft end play must be reset.

(8) Inspect the differential pinion shaft lock pin for damage or looseness in the case. Replace the pin or case as necessary.

(9) Inspect the drive gear for worn or chipped teeth or damaged attaching bolt threads. If replacement of the drive gear is necessary, replace both the drive gear and drive pinion as they are furnished only in matched sets.

(10) Inspect the drive pinion bearing cones and the cups which may have been left in the carrier for pitting, excessive wear, or other visible damage. If inspection reveals that either are unfit for further service, replace the cup and the cone.

(11) Inspect the differential carrier for cracks or other visible damage which would render it unfit for further service. Raised metal on shoulders incurred in removing pinion cups should be flattened by use of a flat nose punch.

(12) Inspect the drive pinion for damaged or excessively worn teeth, damaged bearing journals or splines. If replacement of the pinion is necessary, a new drive gear must also be used as they are furnished only in matched sets. Also inspect the pinion bearing spacer (where used) for distortion and damage.

(13) Inspect the companion flange for cracks, worn splines, pitted, rough or corroded oil seal contacting surface. Repair or replace the companion flange as necessary.

(14) Inspect the pinion bearing shim pack for damaged or distorted shims. Replace the shims with correct ones during establishment of the pinion bearing preload.

5. ASSEMBLING THE DIFFERENTIAL

(1) Install the thrust washer on each of the differential side gears and position the gears in the case.

(2) Through the large side opening of the case, insert each of the two pinions and thrust washers exactly 180 degrees opposite each other, so the pinion shaft holes of the two gears and thrust washers are properly aligned.

(3) Rotate the gears 90 degrees so the pinion shaft holes of the case are in exact alignment with the holes in the two thrust washers and pinions.

(4) From the pinion shaft lock pin hole side of the case, insert the slotted portion of the pinion shaft through the case, the conical thrust washer, and through just one pinion gear.

(5) Install the thrust block between the two pinion gears. The thrust block must be installed so the hole in the block is aligned with the pinion shaft and with the ground sides facing the two side gears.

(6) While keeping all of these parts in proper alignment, push the pinion shaft on through until the locking pin hole in the pinion shaft is in exact alignment with its respective hole in the case and **install the pinion shaft lock pin through the hole in the case** from the pinion shaft side of the drive gear flange, **(8¾ inch gear). (On the 8¼ inch gear, install the pin from the opposite side).**

(7) **Make certain the contacting surfaces of the drive gear and the case flange are clean and free from any burrs and position the drive gear on the case, aligning the threaded holes of the drive gear with those in the case flange.**

(8) Insert the drive gear cap screws through the case flange and into the drive gear. After all cap screws are properly started, tap the gear onto the flange.

(9) Position the unit between the brass jaws of a vise and alternately tighten each cap screw to 60 foot pounds torque.

(10) Position each differential bearing cone on the hub of the case (taper away from ring gear) and with installing Tool DD-1005, install the bearing cones. An arbor press may be used in conjunction with the installing tool.

6. PINION BEARING CUP INSTALLATION

(1) Place the bearing cups squarely in position. Assemble Tool C-758 (shown in Figure 14) by placing spacer (SP-2919) (8¾ inch gear with spacer only.) (Spacer SP-3639 for the 8¼ inch gear) followed by

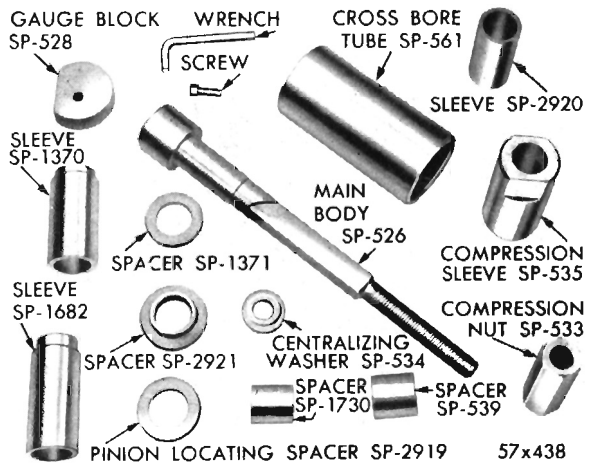


Fig. 14—Tool Set C-758

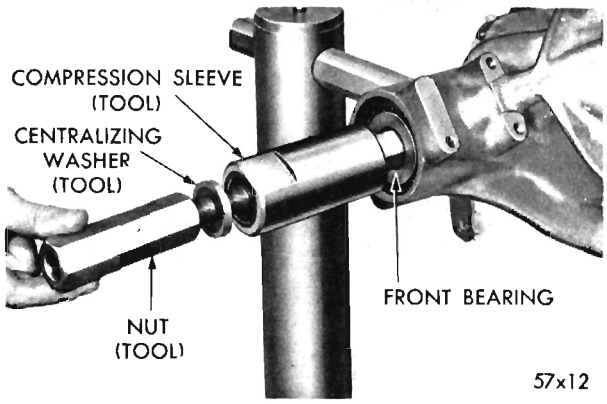


Fig. 15—Compression Sleeve and Centralizing Washer

the rear pinion bearing cone over the main screw of the tool and inserting it into the carrier from the gear side, as shown in Figure 15.

(2) Place the front pinion bearing over the main screw followed by compression sleeve SP-535, centralizing washer SP-534, and main screw nut SP-533. Hold the compression sleeve with companion flange holding Tool C-3281 and tighten the nut, as shown in Figure 16; allowing the tool to rotate as the nut is being tightened in order not to damage the bearings or cups. **Do not remove the tool after installing the cups.**

Two types of drive pinions are used. The method of determining pinion depth of mesh and bearing pre-load are the same for both pinions, however the sequence of making the two adjustments changes. Pinions without a bearing spacer require the depth of mesh adjustment first, while pinions with a separate bearing spacer require bearing pre-load adjustment first.

7. DIFFERENTIAL BEARING PRELOAD—PINION WITH BEARING SPACER

Bearing Pre-Load

(1) With the Tool installed in the carrier, remove the main screw nut, centralizing washer, compression sleeve and the front pinion bearing.

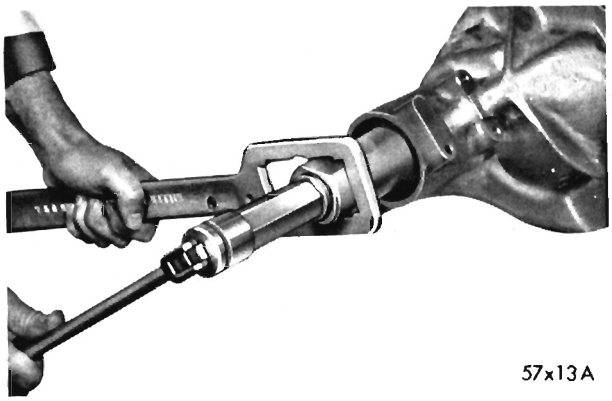


Fig. 16—Seating Bearing Cups in Carrier

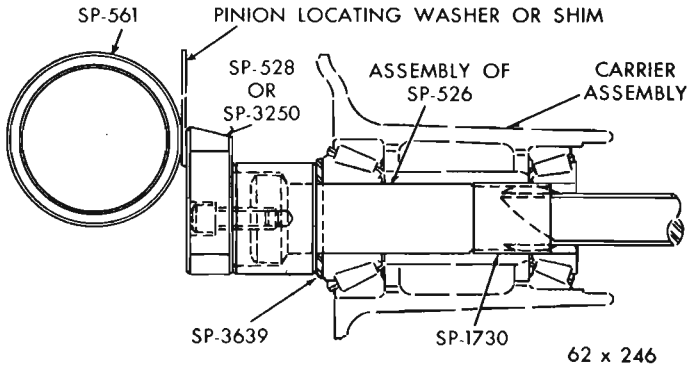
(2) Install the pinion bearing spacer, the larger bore of spacer next to the rear bearing.

(3) Position sleeve (SP-1730) in the front bearing, making sure the sleeve is flush with the rear of the bearing.

(4) Position the original shims, previously removed from the drive pinion shaft, over the sleeve and slide the sleeve bearing and shims over the tool main screw until the shims rest against the spacer, as shown in Figure 17.

(5) Install the tool compression sleeve (SP-535) (square end out), centralizing washer (SP-534) and main screw nut (SP-533). Turn the carrier in the stand to bring the nut on top, as shown in Figure 18.

(6) Tighten the tool nut to 240 foot-pounds torque, and using holding Tool C-3281 on the compression sleeve, to hold the assembly in several positions, to make a complete revolution while tightening. Remove the holding tool and rotate the assembly several turns in both directions to align the bearing rollers. Recheck torque to 240 foot-pounds (torque may have



Pinion Preload (8¼" Ring Gear)

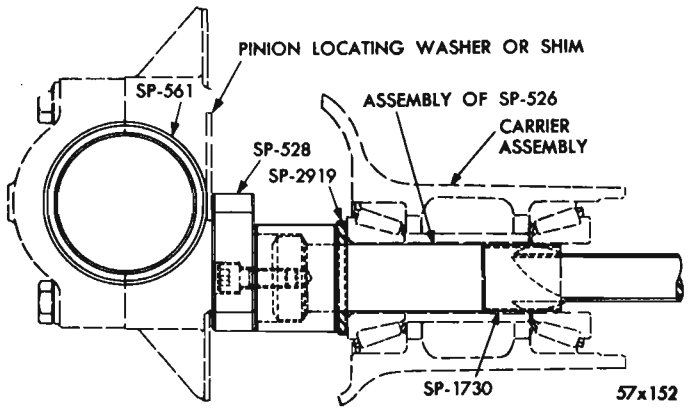


Fig. 17—Pinion Preload with Spacer (8¾" Ring Gear)

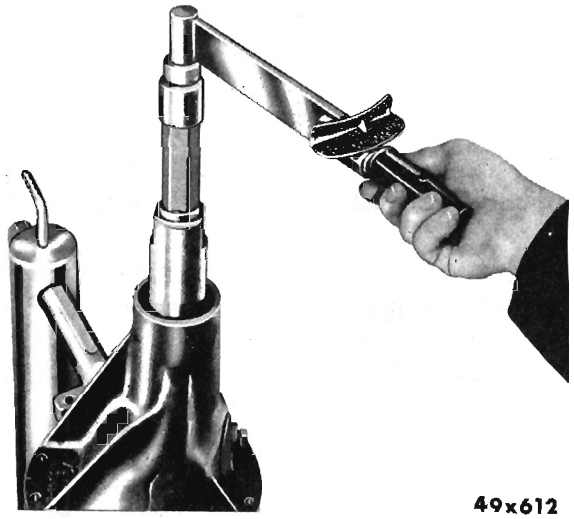


Fig. 18—Checking Preload Torque (inch-pounds)

diminished as bearing rollers were aligned by rotating).

(7) **Correct bearing preload readings can only be obtained with the nose of the carrier up.** Using an inch pound torque wrench Tool C-685, with the handle of the wrench floating, read the torque when the wrench is moving through at least one full rotation. The correct reading is 20 to 30 inch-pounds for a new bearing and zero to 15-inch-pounds for the original bearing and should be uniform during the full rotations. If bearing preload is more than 30 inch-pounds, a thicker shim should be used under front bearing. If bearing preload is less than 20 inch-pounds, a thinner shim should be used. Shims are available in thicknesses of .010, .012, .014, .016, and .018 inch.

After correct pinion bearing preload is established, **do not remove the tool.**

Depth of Mesh

The position of the drive pinion with respect to the drive gear (depth of mesh) is determined by the location of the bearing cup shoulders in the carrier and by the portion of the pinion back of the rear bearing. The thickness of a pinion spacer washer suitable for the carrier can be determined by using Tool C-758.

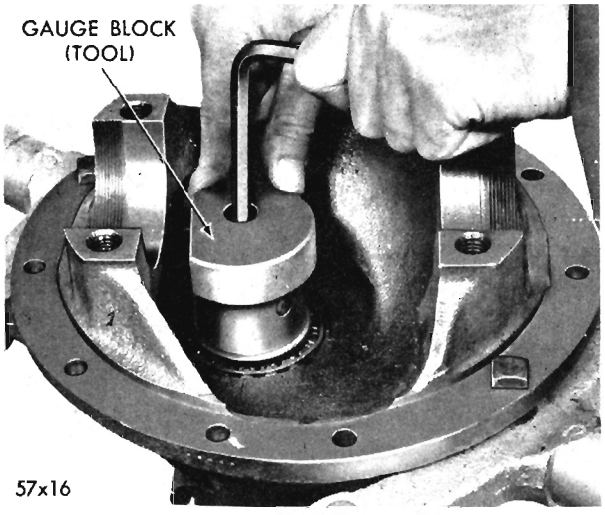


Fig. 19—Installing Gauge Block

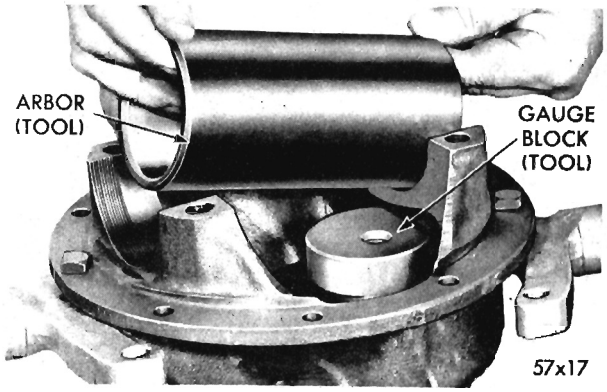


Fig. 20—Installing Arbor

(1) Reverse the carrier in the stand and install gauge block SP-528 on the end of the tool, as shown in Figure 19, securing it to the tool with the allen screw. The flat portion of the spacer should be facing the differential bearing pedestals and the offset of the spacer (or the large portion) toward the center of the carrier. Tighten the screw with an allen wrench.

(2) Position the arbor SP-561 (part of Tool C-758) in the differential bearing pedestals of carrier (Fig. 20). Center the arbor so that an approximate equal distance is maintained at both ends. Position the differential bearing caps and attaching bolts on the carrier pedestals. Between the arbor and each cap insert a piece of .002 inch feeler stock and tighten cap bolts securely.

(3) Select a washer that will fit between the tool gauge block and arbor (Fig. 21). This fit must be snug

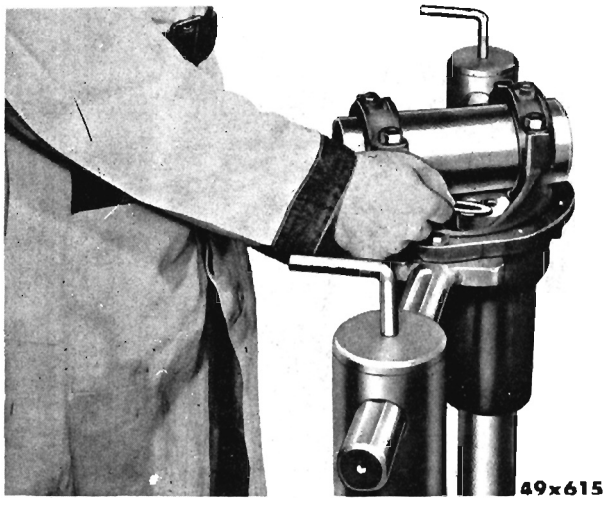


Fig. 21—Determining Spacer Washer Thickness

but not too tight (similar to the pull of a feeler gauge). This washer is then used in determining the correct thickness washer for installation.

(4) To select a washer for installation, read the marking on the end of the pinion (—0, —1, —2, +1, +2, etc.). When the marking is —, add that amount to the thickness of the washer selected in Step 3. Example: With a washer .086 inch thick and a pinion marked —2, install a washer .088 inch thick (.086 + .002 = .088 inch). Example: With a washer .086 inch thick and a pinion marked +2, install a washer .084 inch thick, (.086 — .002 = .084 inch) or when a washer, .086 inch thick is too loose and .088 inch too tight, use .088 inch.

(5) Remove the tool arbor from the carrier.

(6) Remove the tool and bearings from the carrier.

(7) Remove the shims, spacer, tool sleeve, and rear bearing cone from the tool main screw.

(8) With the shaft end of pinion facing up, install the correct pinion spacer washer on the pinion gear shaft. These washers have a chamfer on one side. **The chamfer must face the pinion head.**

(9) Position the rear bearing cone on the pinion shaft (small side away from pinion head). Make certain that the contacting surfaces of the correct washer, pinion head, and rear bearing cone are perfectly clean and free of any foreign particles.

(10) Install the rear bearing cone onto the pinion shaft with Tool DD-996. An arbor press may be used in conjunction with the tool.

(11) Install the bearing tabular spacer on the pinion shaft (large bore facing rear bearing).

(12) Install the selected shim pack.

(13) Lubricate the front and rear pinion shaft bearing cones with heavy oil.

(14) Install the front bearing in its cup in the carrier.

(15) Install the oil seal in the carrier with driver Tool C-3656 (lip of seal must face front bearing). The seal must be driven into the carrier until tool bottoms, as shown in Figure 22.

(16) Insert the pinion shaft up through the carrier. While supporting the pinion in the carrier, install the companion flange with installing Tool C-496 or DD-999.

(17) Remove the tool and install the plain washer (convex side of washer up) and nut.

(18) Hold the companion flange with holding Tool C-3281. Tighten the companion flange nut to 240 foot-pounds torque. Rotate the assembly several turns in both directions to align the bearing rollers. Recheck

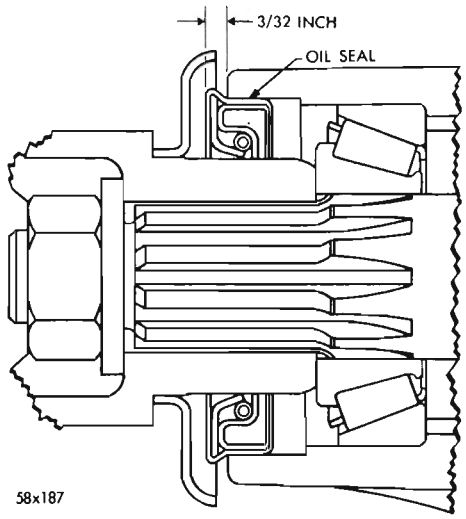


Fig. 22—Pinion Oil Seal Installation

torque to 240 foot-pounds (torque may have diminished as bearing rollers were aligned by rotating).

Differential Bearing Preload—Without Using Tool C-758

Depth of Mesh

(1) If the old and new pinions have the same marking, use the spacing washer of the same thickness as that of the old washer.

(2) If, for example, the pinion being replaced is marked zero (0), and the new pinion is marked plus two (+2), try a .002 inch thinner washer, and if marked minus two (—2) try a .002 inch thicker washer. Due to the fact that these washers are selected more or less by guess, it may be necessary to change the washer several times in order to obtain the correct tooth contact pattern (See Paragraph 8).

Pinion Bearing Preload

(1) With the spacer and the rear bearing installed on the pinion, place the tubular spacer and shims on the pinion and hold the assembly in the carrier.

(2) Install the front bearing and companion flange (without oil seal), using Tool C-496 or DD-999.

(3) Install the washer and nut and tighten to 240 foot-pounds while permitting the assembly to rotate and to prevent damaging the bearings.

(4) Measure the preload (see Paragraph 7).

Installation in Carrier

(1) Install the differential bearing cup on its respective bearing, and position the assembly in the carrier.

(2) Install the differential bearing caps, making certain that the identification marks on the cap cor-

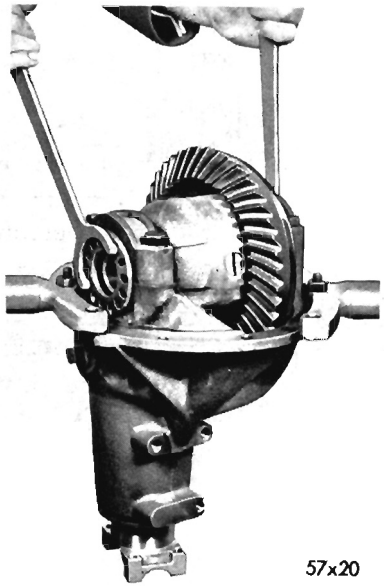


Fig. 23—Adjusting Differential Bearings

respond with those on the carrier. Install attaching bolts and tighten bolts of each cap by hand.

(3) Note the identification marks on the differential bearing adjusters and reinstall each in its respective side.

(4) Screw the adjuster in by hand. No attempt should be made at this time to apply any excessive pressure. To square the bearing cups with the bearing, turn the adjusters "in" with spanner wrench Tool C-406A, as shown in Figure 23, until the cups are properly squared with the bearings and the end play eliminated, with some back lash existing between the drive gear and pinion.

(5) While facing each bearing support cap, tighten the left hand bolt 85 to 90 foot-pounds torque on each side.

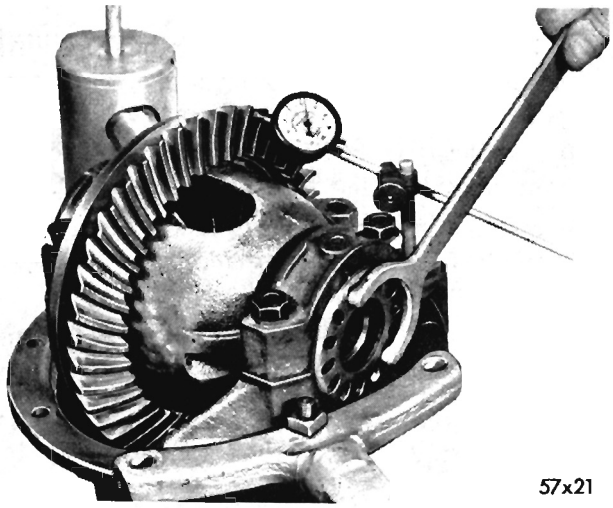


Fig. 24—Measuring Backlash of Drive Gear and Pinion

(6) Secure dial indicator Tool C-340 or C-3339 to a carrier flange so the pointer or indicator is squarely contacting one of the drive gear teeth (drive side) (Fig. 24.)

Back-Lash

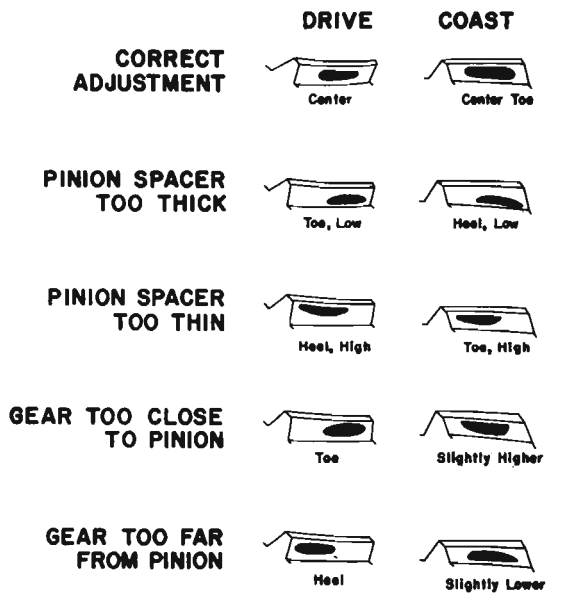
(1) Measure the back lash between the drive gear and pinion. After the first reading is taken, move the dial indicator away from the tooth sufficiently to rotate the drive gear approximately 90 degrees and again measure the back lash. The back lash should be measured in four different positions to determine the least clearance between the drive gear and pinion. After the point of least clearance has been established, mark the drive gear. **Do not rotate the drive gear from the point of least clearance until all adjustments have been completed.**

(2) Turn both bearing adjusters equally (in the same direction) until the back lash between the drive gear and the pinion is .0005 inch to .0015 inch. **This back lash variation is given to permit alignment and installation of the bearing adjuster lock, lock washer and attaching bolt. The adjuster must only be turned in a clockwise direction and under no circumstances should be backed off.**

(3) Install the adjuster lock on the back-face side of the drive gear.

Preload

(1) Turn the other bearing adjuster (tooth side of



1. PINION SPACER CHANGES AFFECT THE COAST SIDE CONTACT FASTER THAN THE DRIVE SIDE
2. BACKLASH ADJUSTMENTS AFFECT THE DRIVE SIDE CONTACT MUCH FASTER THAN THE COAST SIDE
3. ALL BACKLASH MEASUREMENTS SHOULD BE MADE AT THE POINT OF MINIMUM BACKLASH

60x1022A

Fig. 25—Gear Tooth Contact Pattern

drive gear) (Fig. 24) in a notch at a time (notch referred to is the adjuster lock holes) until the backlash between the drive gear and pinion is a minimum of .006 inch to .008 inch. This will pre-load the bearings and establish the correct backlash.

(2) Tighten the remaining two bearing support cap bolts 85 to 90 foot-pounds torque.

(3) Install the remaining adjuster lock, lockwasher and attaching bolt. Tighten the lock retaining cap screws 15 to 20 foot-pounds torque.

8. GEAR TOOTH CONTACT PATTERN

The gear tooth contact pattern (Fig. 25) will disclose whether the correct washer has been installed behind the pinion rear bearing, and the drive gear has been positioned properly.

Checking Tooth Contact Pattern

Apply red lead to the drive gear teeth and apply a load against the back of the drive gear with a round bar. As this pressure is being applied to the drive gear, rotate the pinion. This action will leave a distinct contact pattern on the gear teeth. The series of illustrations show the correct pattern as well as a series of incorrect patterns. (Fig. 25).

Heavy Face Contact

If the tooth pattern is across the length of the tooth face, narrow and near the top, the teeth will wear thin and roll over or score, resulting in excessive gear lash and noise. This condition is corrected by installing a thicker washer behind the pinion rear bearing.

Heavy Flank Contact

If the tooth pattern is across the length of the tooth, narrow and low on the flank, the pinion teeth will score and also result in noise. This condition is corrected by installing a thinner washer behind the pinion rear bearing.

Heavy Toe Contact

If the tooth pattern is heavy on the toe of the tooth, the edges of the teeth may chip resulting in excessive damage to the entire assembly. This condition is corrected by moving the ring gear away from the pinion. This will increase the backlash making it again necessary to insert a thicker washer behind the pinion rear bearing.

Heavy Heel Contact

If the tooth pattern is heavy on the heel of the teeth, the edges of the teeth may chip resulting in excessive damage to the entire assembly. This condition is corrected by moving the drive gear toward the pinion. This would result in decreasing the backlash making it again necessary to insert a thinner washer behind the pinion rear bearing.

9. WELDING REAR AXLE HOUSING

The axle housing should be completely disassembled if it is to be welded with arc welding equipment. It is also possible to weld the assembled housing with gas welding equipment, if precaution is taken to protect gaskets and heat-treated parts.

10. CARRIER ASSEMBLY INSTALLATION

(1) Using a new gasket, install the carrier assembly to the axle housing. Tighten mounting nuts to 45 foot-pounds torque

(2) Press the bearing on the axle shaft. Lubricate the bearing rollers, align the axle spline, and insert the axle shaft in the housing. Install the axle drive shaft outer bearing cup with Tool C-413.

(3) Install the shims in the same manner in which they were removed to maintain a central position of the axle shaft thrust block. Install a new seal in the brake support plates with Tool C-3565 with the lip of seal facing toward the center of the vehicle.

(4) Install the brake support plates and tighten the nuts 30 to 35 foot-pounds torque.

(5) Measure the axle shaft end play, as outlined in Paragraph 2.

(6) Install the hub and drum assembly.

(7) Tighten the axle shaft nuts to 145 foot-pounds, minimum, and install new cotter keys.

(8) Connect the rear universal joint.

(9) Remove the block from the brake pedal and bleed the brake lines.

(10) Refill the axle housing and carrier assembly with the specified lubricant. Refer to "Lubrication", Group 0.

SURE-GRIP DIFFERENTIAL

The sure-grip differential (Figs. 26, 27, 28 and 29) is similar to the conventional differential except for the addition of friction plates and belleville plates and discs for clutching the differential case to the differential gears and a means for engaging these plates. It has four pinion gears, positioned in the case by two pinion shafts which are at right angles to each other and loose fitting at their inter-section. Both ends of each shaft have two flat surfaces, or ramps, which mate with identical ramps in the differential case. There is additional clearance in the case to permit slight sideplay of the ends of the pinion shafts within the case.

SERVICE PROCEDURES

11. SURE GRIP DIFFERENTIAL IDENTIFICATION

Identification of Sure-Grip type differential assembly can be made by the letter "S" stamped on the identification pad on the right side of carrier housing, or by a metal tag reading. "Use Sure-Grip Lube" attached by means of the rear axle housing-to-carrier bolt, below the carrier filler plug. If the letter "S" or tag is not apparent, remove filler plug and use a flashlight to look up through the filler plug hole to identify the type of differential case. The sure-grip-type differential case (two-piece construction) has attaching bolts. The conventional type differential case (one-piece construction) has a dome-like shape with no case cap attaching bolts.

Whenever the rear axle shafts have been removed from the "Sure-Grip" axle assembly always determine that the thrust spacers have not fallen out of the pinion shaft (Fig. 27). The spacers may be observed through the axle shaft opening of the axle housing. This may be done with the aid of a small flashlight. If the spacers are out of place it will be necessary to disassemble the "Sure-Grip" differential to reinstall them.

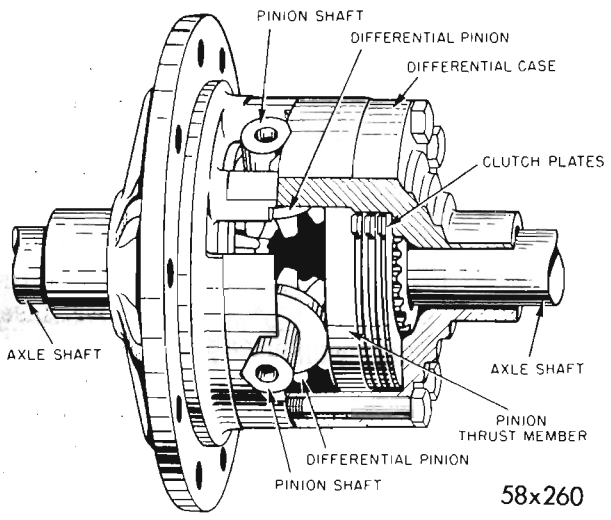


Fig. 26—Sure-Grip Differential (Schematic)

12. LUBRICATION

Use Multipurpose Gear Lubricant as defined by MIL-L-2105B or Mopar Hypoid Lubricant, Part No. 1879414. Refer to Group "O", Lubrication for servicing.

13. REMOVAL AND INSTALLATION

WARNING: Before raising a rear wheel off the ground shut off engine, set parking brake tightly: carefully block front wheel, (diagonally opposite the one to be removed) against both forward and rearward movement.

Follow the same procedure as outlined under the removal and installation of the conventional rear axle differential.

14. DISASSEMBLY

(1) Remove the axle drive gear. Measure the runout of the drive gear mounting flange. Replace both case halves if runout exceeds .003 inch. **Before disassembling the case halves, place scribe marks on each half to aid in aligning the case when reassembling (Fig. 30).**

(2) Remove the case cap attaching bolts and remove the case cap (Fig. 31) and clutch plates (Fig. 32).

(3) Remove the side gear retainer (Fig. 33), and the side gear (Fig. 34).

(4) Remove the pinion shafts with pinion gears (Fig. 35).

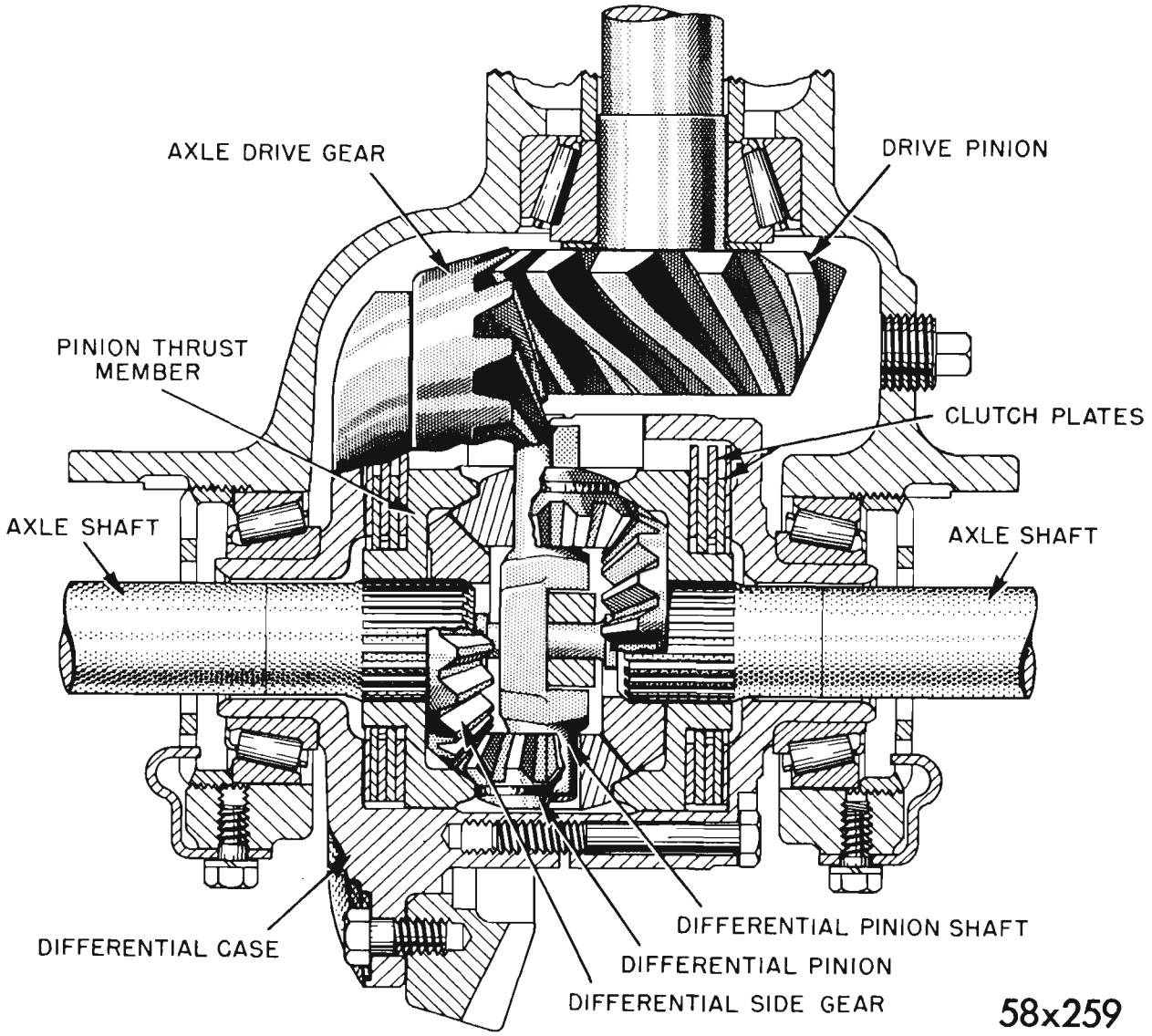


Fig. 27—Sure-Grip Differential (Cross-Section)

(5) Remove the remaining side gear (Fig. 36), side gear retainer (Fig. 37) and clutch plates (Fig. 38).

(6) Remove the axle shaft thrust spacer by pressing out the lock pin.

15. CLEANING AND INSPECTION

Clean all parts thoroughly. Inspect all the parts for wear, nicks and burrs. Replace worn or distorted clutch plates. If the case is worn, it will be necessary to replace both halves.

16. ASSEMBLY

(1) Position the clutch plates and discs in their proper location, in each half of the case, as shown in Figure 39.

(2) Place the side gears in their retainers. Insert splines of the retainers through splines of the clutch disc.

(3) Place the aligning pin through one axle shaft thrust spacer. Assemble the pinion shafts on the aligning pin.

(4) Place the pinion gears on the shafts and install the assembly on the drive gear half of case. Insert the thrust spacer in the pinion shaft (Fig. 40).

(5) Slide the cap half of the case over the edge of the bench far enough to insert one finger up through the assembly to hold it together. Place the assembly on the drive gear half, matching the scribe marks.

(6) Make sure the markings on each differential

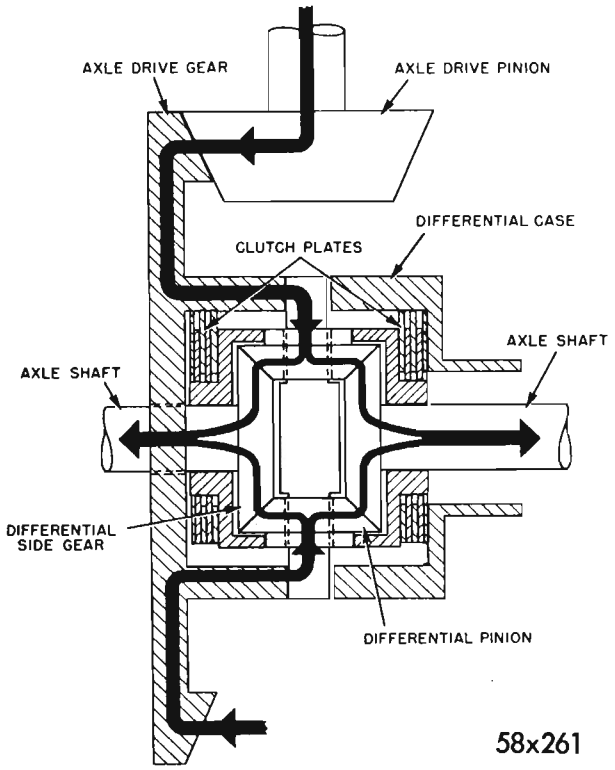


Fig. 28—Power-Flow—Axle Shafts Turning at Same Speed

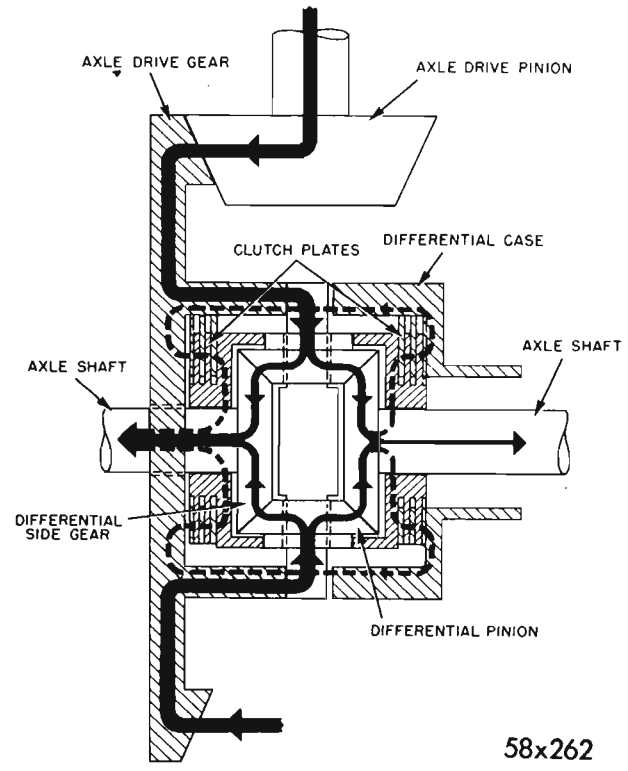


Fig. 29—Power-Flow—Axle Shafts Turning at Different Speeds

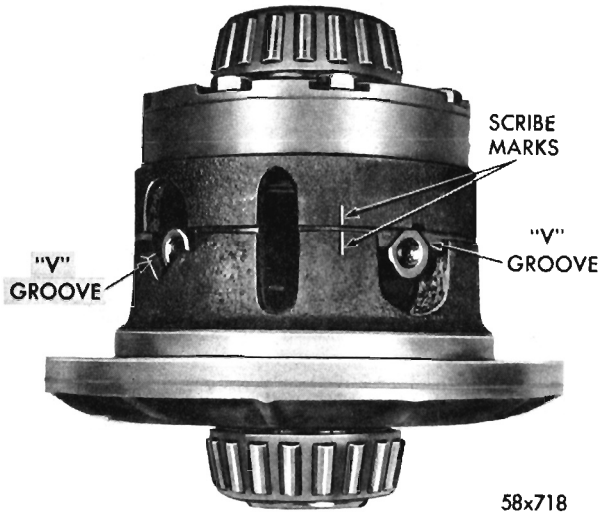


Fig. 30—Case Halves Scribed for Reassembly

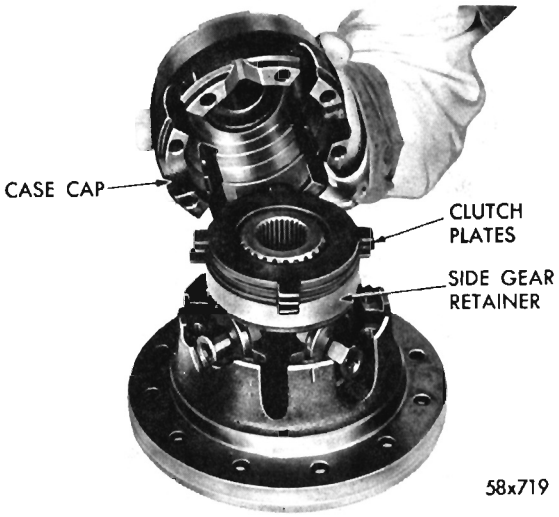


Fig. 31—Removing or Installing Differential Case Cap

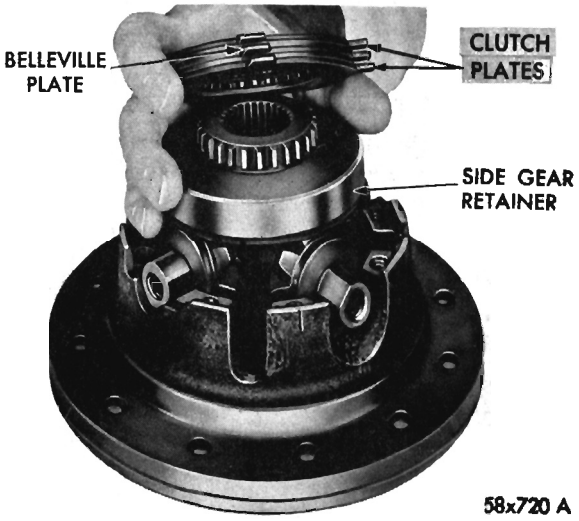


Fig. 32—Removing or Installing Clutch Plates (Cap Side)

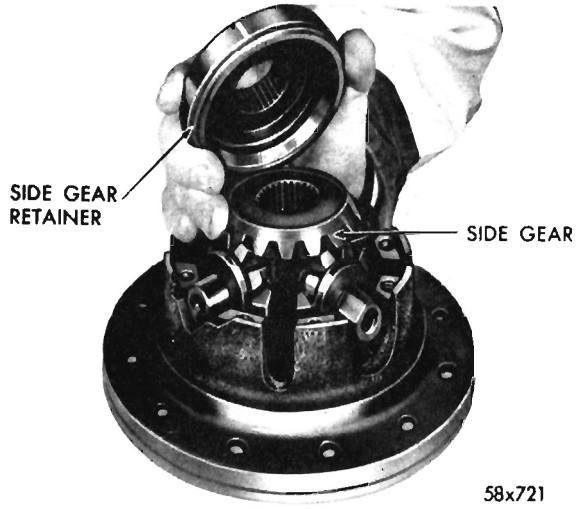


Fig. 33—Removing or Installing Side Gear Retainer (Cap Side)

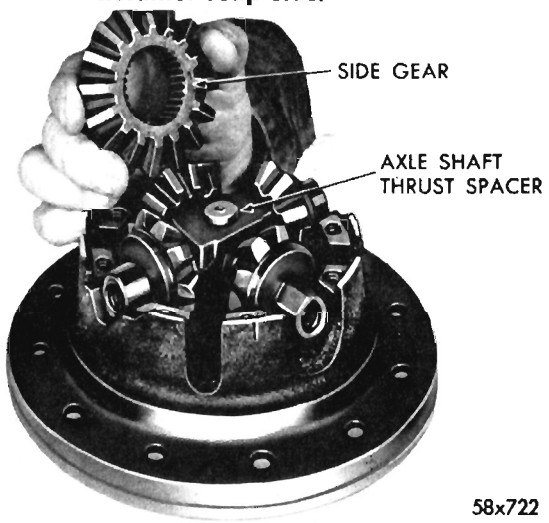


Fig. 34—Removing or Installing Side Gear (Cap Side)

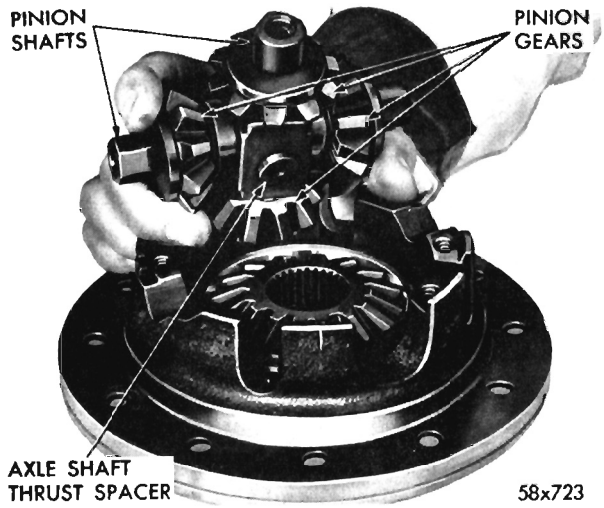


Fig. 35—Removing or Installing Pinion Shafts and Gears

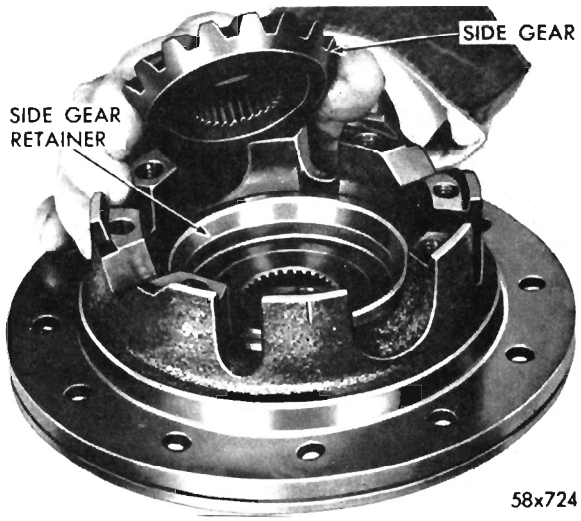


Fig. 36—Removing or Installing Side Gear from Case

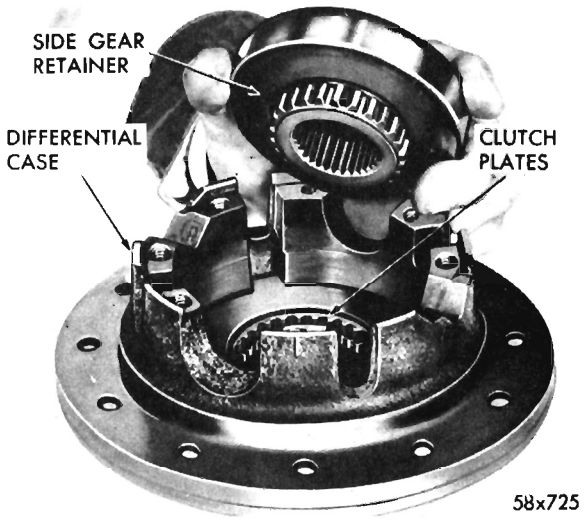


Fig. 37—Removing or Installing Side Gear Retainer

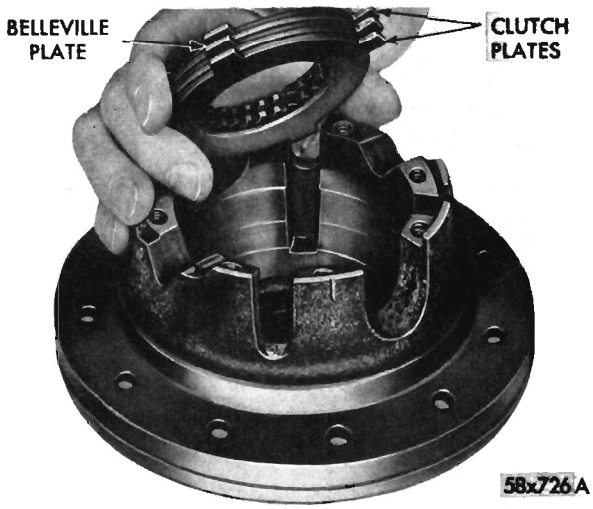


Fig. 38—Removing or Installing Clutch Plates

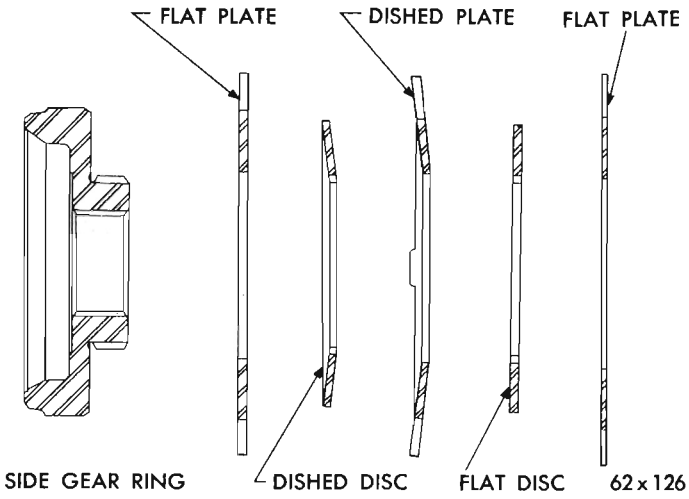


Fig. 39—Arrangement of Clutch Plates, Discs and Washers

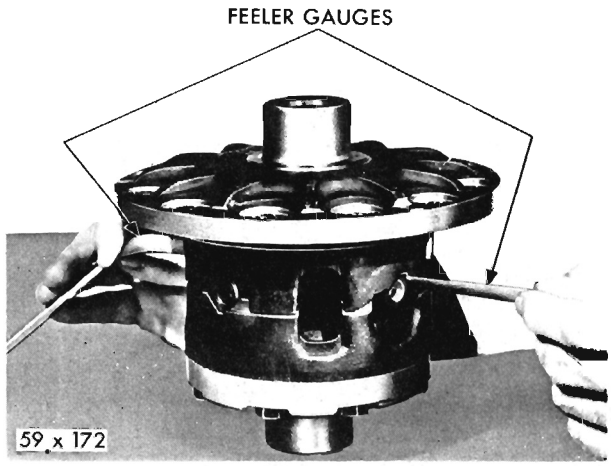


Fig. 42—Checking Clearance of Pinion Shaft and Cap

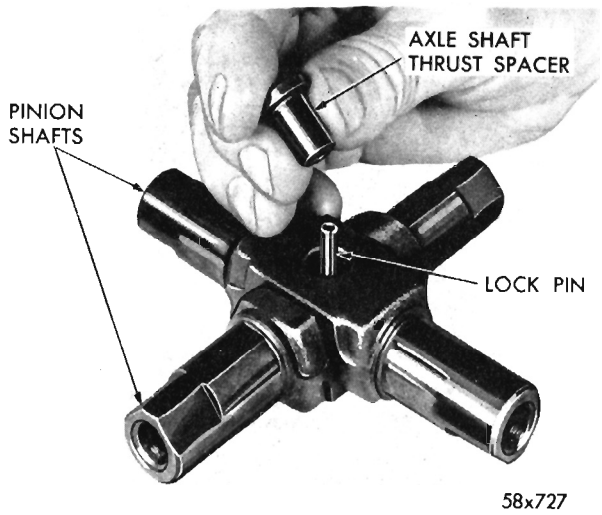


Fig. 40—Installing Axle Shaft Thrust Spacers

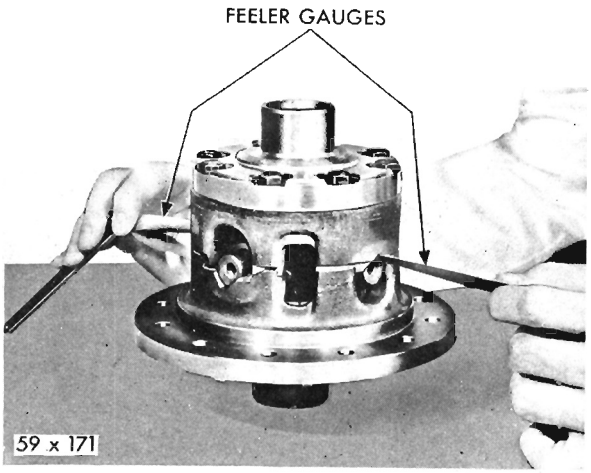


Fig. 41—Checking Clearance Between Pinion Shaft and Case

case half coincide. Install the differential case bolts and turn them in a few threads.

(7) Insert the axle shafts from the vehicle to align the splines. Make sure the axle shafts engage the side gear splines as well as the clutch ring splines.

(8) With the shafts installed, center the cross shafts between the two ramp surfaces in the differential case. Tighten the differential case bolts evenly by alternately turning the opposite bolts until all are tightened to 45 foot-pounds torque. After assembly, slight misalignment of the splines can be corrected by moving the axle shafts back and forth until free. Remove the axle shafts.

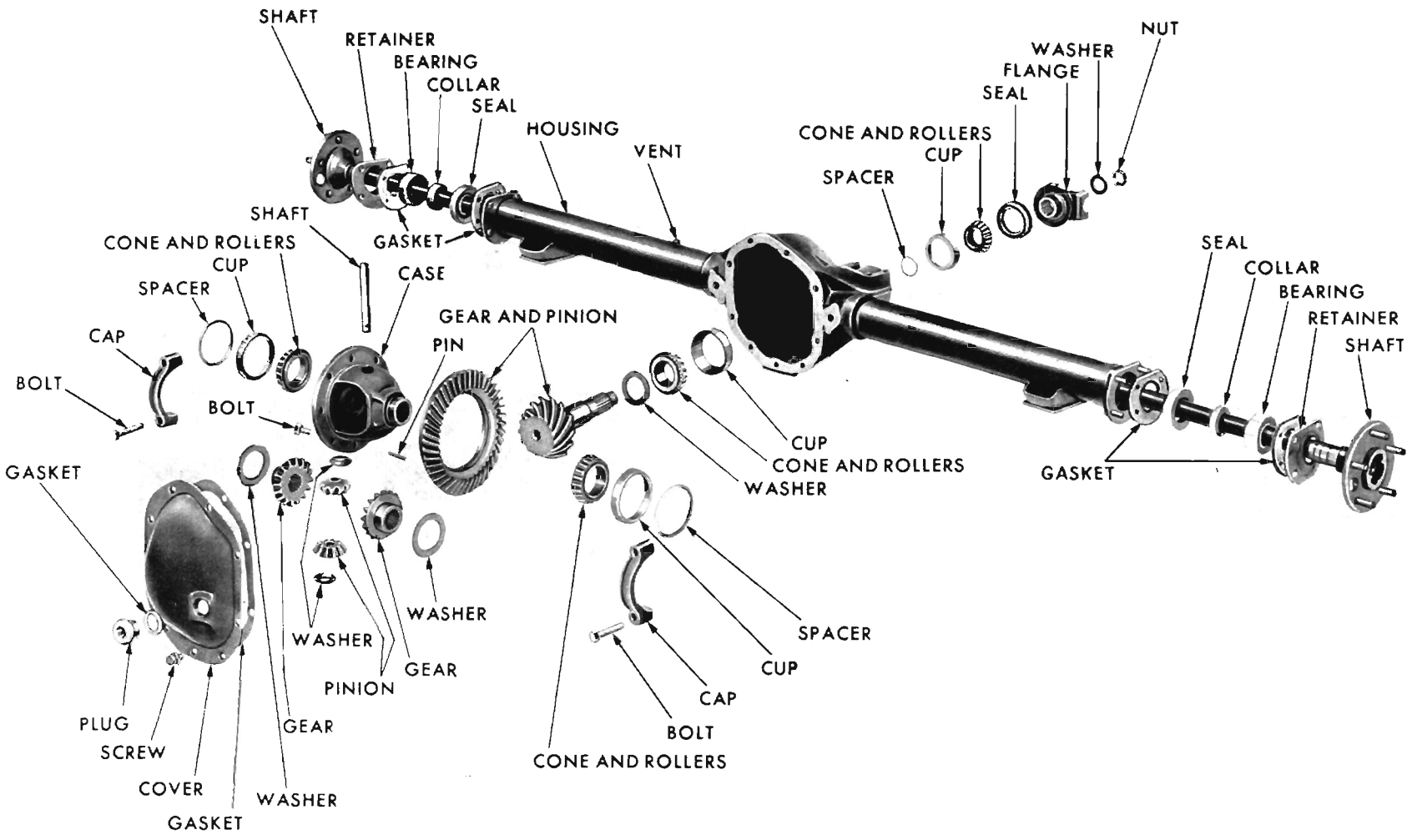
(9) With the differential resting on one hub, insert two feeler blades, one over each end of the pinion shaft having ramps above it (Fig. 41). The clearance should not exceed .010 inch at each end of the shaft.

(10) Invert the differential to rest on the opposite hub. Check the opposite pinion shaft in like manner to the same specifications (Fig. 42).

Measurements over .010 inch indicate that the clutch discs are worn and should be replaced. New discs and plates may produce a clearance of as little as .002 inch.

With either new or used discs, the measurement of the two shafts should be within .005 inch of each other.

Use driver Tool C-3565 when installing the rear axle shaft outer oil seal and the seal protector when installing the brake support plate over the rear axle shaft.



60x1606B

Fig. 43—Rear Axle Assembly

REAR AXLE

VALIANT MODELS VV-1

The rear axle housing, shown in Figure 43, is a one-piece assembly. The drive pinion and the differential case with drive gear are mounted directly to the center (carrier) section of the housing assembly. Access to the differential, drive gears and carrier bearings is obtained by removal of the carrier cover. Axle shafts and the pinion oil seal can be removed without removing the assembly from the vehicle, but the unit should be removed for any additional operations. Gear ratio identification numbers are stamped on the front face of the pad at the bottom of the carrier.

SERVICE PROCEDURES

17. REAR AXLE—REMOVAL

Should it become necessary to remove the rear axle for overhaul or repair, refer to Figure 43, then proceed as follows:

(1) Raise the rear of the vehicle until the rear wheels clear the floor. Support the body at the front of the rear springs.

(2) Block the brake pedal up.

(3) Remove the rear wheels.

(4) Disconnect the hydraulic flexible line.

(5) Disconnect the parking brake cable support at the transmission.

(6) Disconnect the propeller shaft at the differential yoke.

(7) Remove the rear spring clips (U bolts) and the shock absorbers.

(8) Remove the axle assembly from the vehicle.

18. AXLE SHAFT REMOVAL AND DISASSEMBLY

(1) With the wheel removed, remove the clips holding the brake drum on the wheel studs and remove the drum.

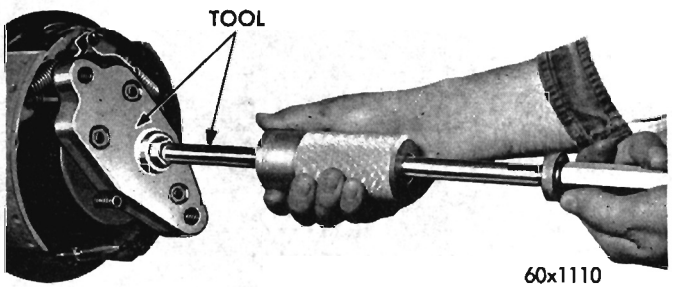


Fig. 44 —Removing Axle Shaft

(2) Disconnect the brake lines at the wheel cylinders.

(3) Using the access hole in the axle flange, remove the retainer nuts from the end of the housing.

(4) Attach the axle shaft puller Tool C-3725 to the axle shaft flange and remove the axle shaft and brake assembly from the housing. Remove the brake assembly from the axle shaft with care, to avoid damaging the shaft in the seal contact area, as shown in Figure 44.

(5) Remove the axle shaft oil seal from the housing.

(6) Place the axle shaft bearing retaining collar on a heavy vise or anvil and using a chisel cut a deep groove into the collar at 90 degree intervals (Figure 45). This will enlarge the bore of the collar and permit it to be driven off of the axle shaft. Using a blunt chisel or drift drive the bearing off of the axle shaft. Care should be taken not to damage the axle shaft.

19. DIFFERENTIAL REMOVAL AND DISASSEMBLY

Side play and runout measurements taken during

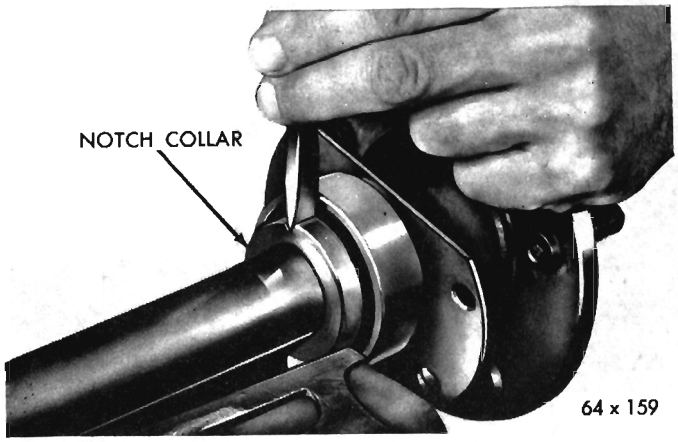


Fig. 45—Removing Axle Shaft Bearing and Collar

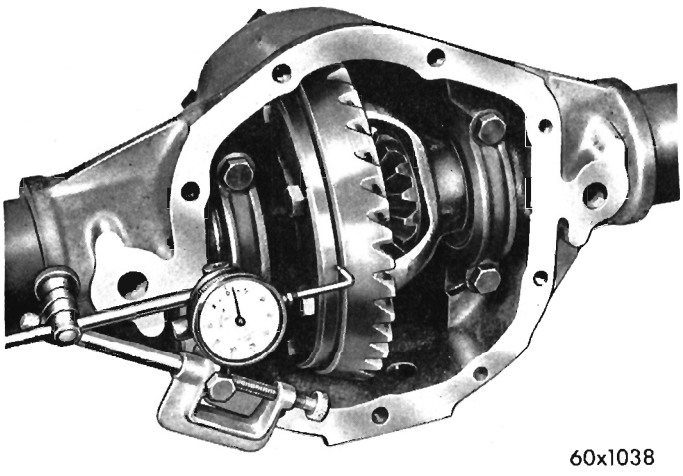


Fig. 46—Measuring Drive Gear Runout

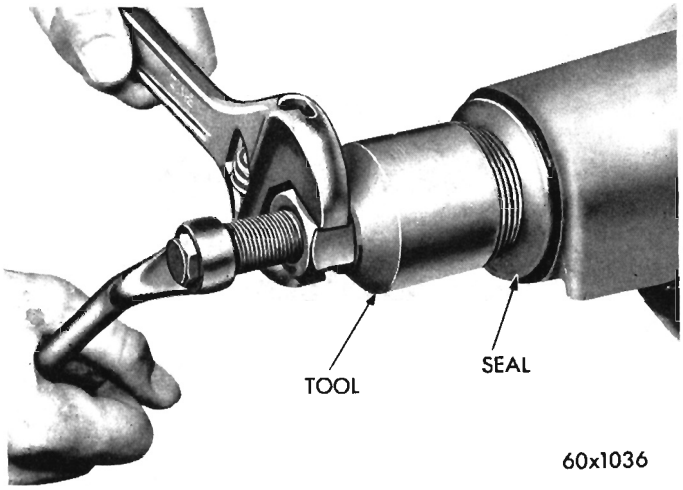


Fig. 48—Removing Pinion Oil Seal

disassembly will be very useful in reassembly.

(1) Drain the lubricant from the housing, and turn the unit to have the cover facing up.

(2) Remove the cover and clean the differential case and drive gear with kerosene, mineral spirits or other similar cleaning fluid.

(3) Measure for differential side play. **There should be no side play.**

(4) To measure the drive gear runout on the differential case, (provided no side play was found) mount a dial indicator Tool C-3339 on pilot stud Tool C-3288, and load the indicator slightly when the plunger is at right angles to the back face of the drive gear. (Refer to Figure 46.)

(5) Measure the drive gear runout by reading the dial indicator, while turning the drive gear several complete rotations. Mark the drive gear and the case at the point of maximum runout for use later in measuring the differential case. The total indicator reading should be no more than .005 inch.

If the runout is over .005 inch, the differential case may have been sprung. A test of the case will be described later.

(6) Remove the pinion nut and yoke with puller Tool C-452 and holding Tool C-3281, as shown in Figure 47.

(7) Remove the pinion oil seal with Puller Tool C-748. (Fig. 48.) Remove the pinion front bearing and preload space washer.

(8) Mark the carrier and differential bearing caps for location in assembly, as shown in Figure 49.

(9) Remove the bearing caps and locate the spreader Tool C-3721 on the carrier with the tool dowels seated in the locating holes in the carrier. Turn the tool screw only finger tight at this time.

(10) Install a pilot stud, Tool C-3288 in one side of the carrier. Attach a dial indicator and load the indicator slightly against the opposite side of the

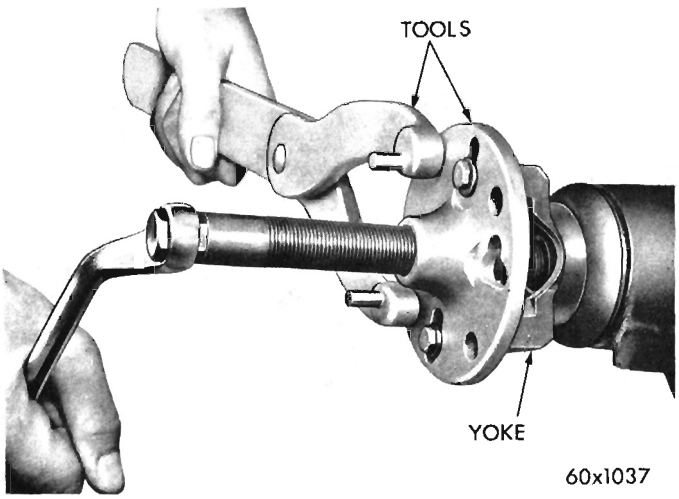


Fig. 47—Removing Pinion Yoke

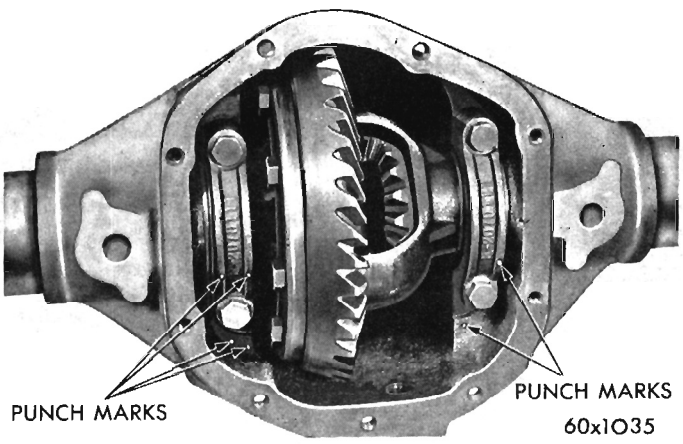


Fig. 49—Bearing Cap Identification

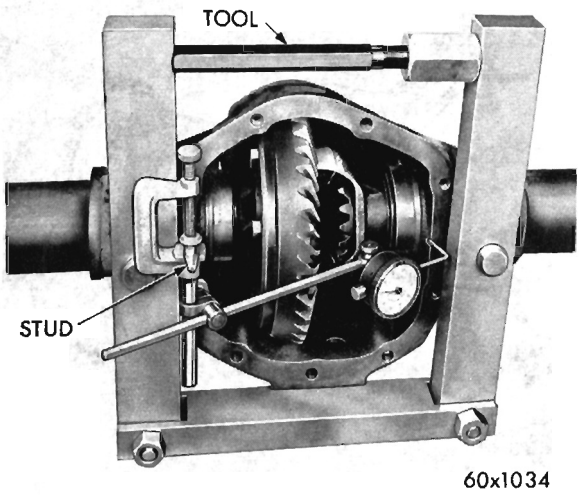


Fig. 50—Spreading Rear Axle Housing

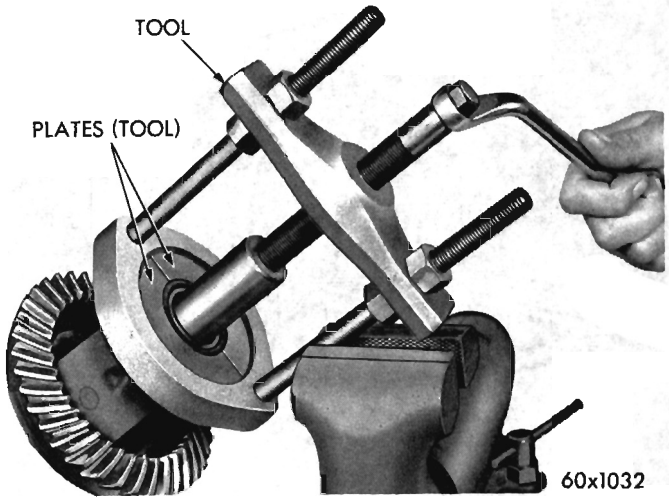


Fig. 52—Removing Differential Carrier Bearing

carrier (Fig. 50).

(11) The carrier must be spread sufficiently (.012-.015") to permit removal of the differential, but **not over .020 inch.**

(12) Remove the dial indicator and remove the differential assembly from the carrier. A light prying action can be used to unseat the differential from the carrier (Fig. 51). Identify the bearing cups and preload washers for location in reassembly. Do not remove the spreader tool.

(13) Remove the pinion from the carrier.

(14) Remove the pinion bearing caps with a flat end brass drift.

(15) Mount the differential case assembly in a vise equipped with soft jaws.

(16) Remove the drive gear bolts. **BOLTS ARE LEFT HAND THREAD.** Remove the drive gear.

(17) If the drive gear runout exceeded .005 inch in step 4, the differential case flange runout should be measured. Install the differential case and spacer washer in the carrier and loosen the spreader tool. Mount dial indicator in contact with the drive gear side of the flange to take a reading as in steps 3, 4 and 5. Total allowable runout should not exceed .003 inch. In a case of slight runout, it may be possible during assembly to locate the high runout section of the drive gear, opposite (180°) from the runout section of the case to reduce the tolerance of the assembly.

(18) Drive the differential pinion shaft lock pin out of the case from the drive gear end of case.

(19) Remove the differential shaft with a brass drift.

(20) Rotate the axle side gear to remove the pinion gears and washers.

(21) Remove the axle side gears and washers.

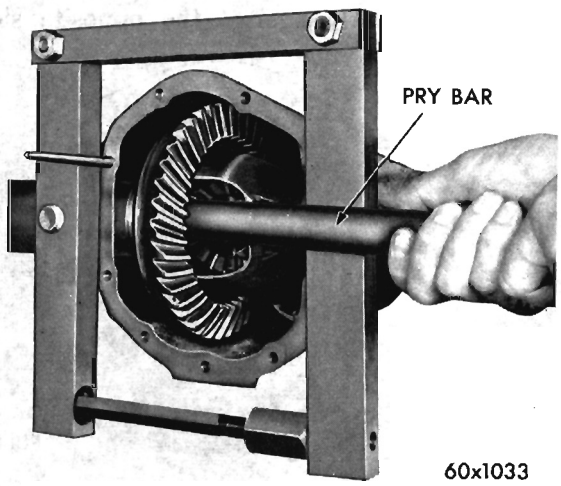


Fig. 51—Loosening Differential Assembly

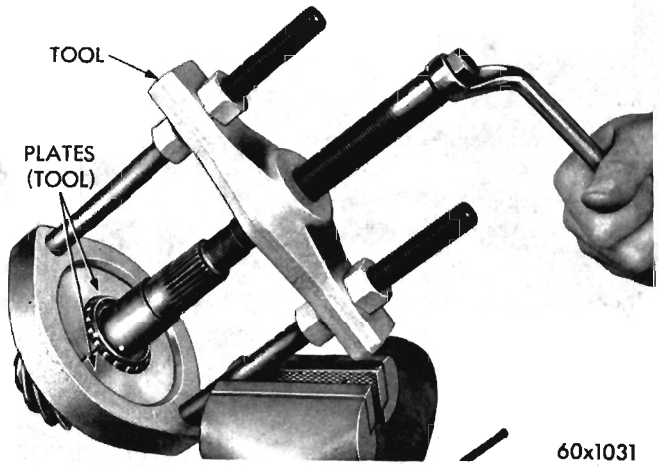


Fig. 53—Removing Pinion Rear Bearing

(22) Remove the differential bearings with puller Tool C-293 and No. 39 plates, as shown in Figure 52.

(23) Remove the pinion rear bearing with puller Tool C-293 and No. 40 plates, as shown in Figure 53.

20. CLEANING AND INSPECTION

(1) Clean all parts except the ball bearings with kerosene, mineral spirits or other similar cleaning fluids. Clean the housing tubes with a clean cloth by inserting a stiff wire from the ends of tubes into the carrier section, and withdraw the cleaning cloth from the center outward. Wipe the ball bearings with a damp cloth.

(2) The two differential bearing cup contact areas in the carrier should be smooth and flat, without raised metal either in the contact areas or the edges of the machined surfaces. The bearing caps should also have undamaged machined surfaces and be free from raised metal edges along both sides and also around the bolt holes.

In the drive pinion section of the carrier the bearing cup bores should be smooth and flat. Raised metal on shoulders of the bores incurred in removing the cups, should be flattened by use of a flat nose punch.

(3) The axle drive shaft bearing and oil seal bores at both ends of the housing should be smooth and free from rust or damage.

(4) The axle drive shaft splines should be straight and free from excessive wear. The shaft bearing and retainer area must be smooth and free from all raised metal. When it is necessary to clean this portion, remove only the raised metal and use crocus cloth to polish the area **without reducing the diameter of the shaft.**

(5) If the axle shaft bearings were removed from the shafts, install new bearings and retaining collars as these parts are unfit for further use after removal.

(6) Taper roller bearing cone assemblies should have a smooth, unbroken surface on the cone and both shoulders. The rollers should also have smooth, unbroken surfaces. The roller retainer should be free from damage and cracks. Bearing cups should have a smooth unbroken surface.

(7) Differential pinion gears and side gears should have smooth teeth with a uniform contact pattern, without excessive wear or broken surfaces. The hub surfaces of side gears should be smooth and the splines should be straight and without excessive wear. The outer surface of the pinion gears should be smooth and bright. Thrust washers should be smooth and unbroken.

(8) Inside the differential case, the machined areas should be polished, without surface imperfections. The pinion shaft bore in the case should be round and smooth. Both ends of the pinion shaft should also be round and without excessive wear.

(9) The drive gear teeth should have a uniform contact pattern and have smooth, unbroken surfaces without excessive wear. The pinion teeth should have a similar appearance. The machined surfaces of the pinion shaft and back face of the head should be undamaged and without wear. (See Figs. 54 and 55.)

(10) Use new gaskets and oil seals during assembly.

21. ASSEMBLING THE DIFFERENTIAL

If new differential side gears are to be installed,

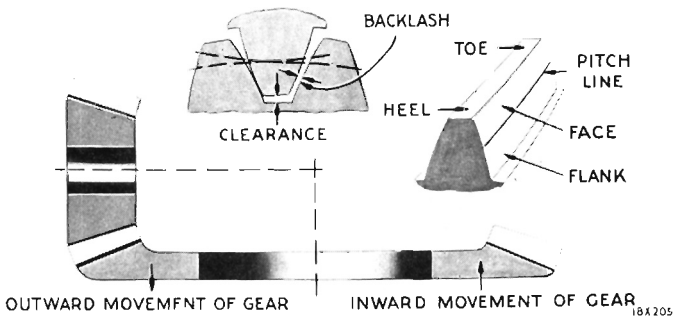
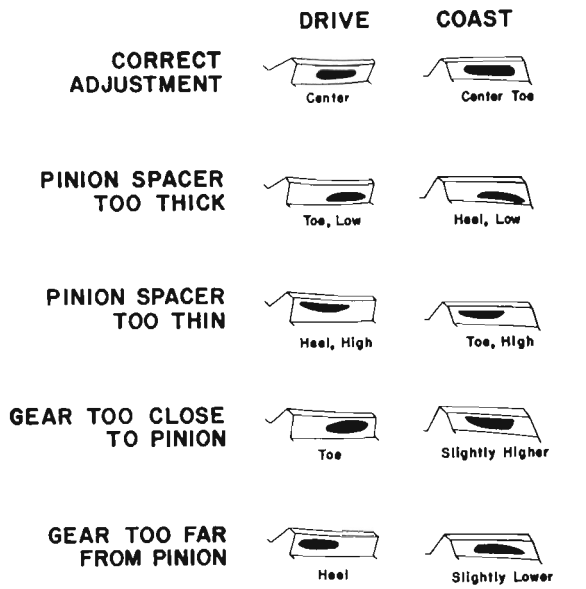


Fig. 54—Gear Tooth Contact Pattern



1. PINION SPACER CHANGES AFFECT THE COAST SIDE CONTACT FASTER THAN THE DRIVE SIDE
2. BACKLASH ADJUSTMENTS AFFECT THE DRIVE SIDE CONTACT MUCH FASTER THAN THE COAST SIDE
3. ALL BACKLASH MEASUREMENTS SHOULD BE MADE AT THE POINT OF MINIMUM BACKLASH

60x1022A

Fig. 55—Tooth Contact Pattern

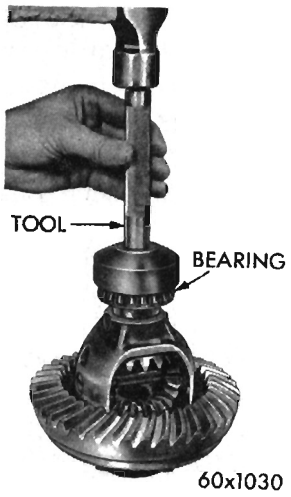


Fig. 56—Installing Differential Bearing

place a new thrust washer over the hub of each gear and install in position in the differential case, then proceed as follows:

Lubricate All Parts When Assembling and Adjusting

(1) Install the thrust washers on the differential side gears and position the gears in the case.

(2) Place the thrust washers on both pinion gears and mesh the pinion gears with the side gears, having the pinion gears exactly 180 degrees apart.

(3) Rotate the gears to align the pinion gears and washers with the shaft holes in the case.

(4) Install the pinion gear shaft with care so as not to damage the thrust washers and to have the hole in the shaft aligned with the lock pin hole in the case.

(5) Install the lock pin from the drive gear teeth side of the case.

(6) Position the drive gear on the case to separate the points of maximum runout 180° and start all bolts through the case into the drive gear, finger tight. **(BOLTS ARE LEFT HAND THREAD.)**

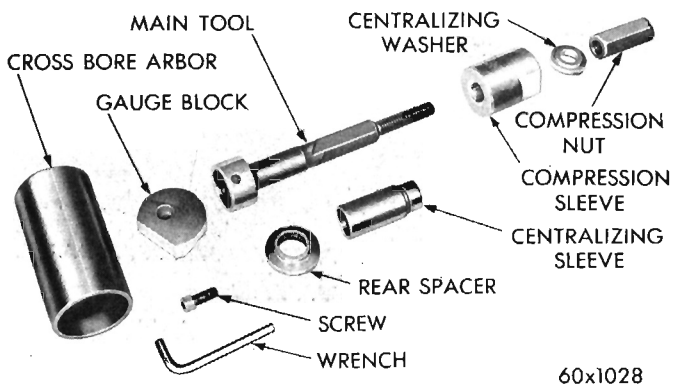


Fig. 57—Pinion Setting Gauge Tool

(7) Tap the drive gear against the flange. Tighten the bolts to 55 foot-pounds torque.

(8) Install the bearing cones with driver, Tool C-3716, as shown in Figure 56.

22. PINION BEARING CUP INSTALLATION

The rear axle gauge Tool C-3715 is used to install the pinion bearing cups as well as to determine the pinion depth of mesh. (See Figure 57.)

(1) Start both bearing cups into the carrier.

(2) Place the rear spacer SP-3244 on main tool. Seat the pinion rear bearing on the spacer and hold the tool in housing.

(3) Place centralizing sleeve SP-3245 on the tool and place the pinion front bearing cone on the centralizing sleeve, then the tool compression sleeve, centralizing washer and nut.

(4) Draw the cups tightly against the housing shoulders by tightening the nut while holding the compression sleeve from turning with Tool C-3281. Permit the tool to turn to several rotations during the tightening operation. Leave the tool in the carrier for determining depth of mesh.

23. DRIVE PINION DEPTH OF MESH (Using Tool C-3715)

(1) With the main tool left in the carrier after installing the pinion bearing cups, loosen the tool nut and retighten to produce 15 to 25 inch-pounds of turning torque. Attach the gauge block to the main tool.

(2) Place the cross bore arbor in the carrier and install the caps. Tighten the cap bolts lightly.

(3) Select a bearing spacer washer which will fit

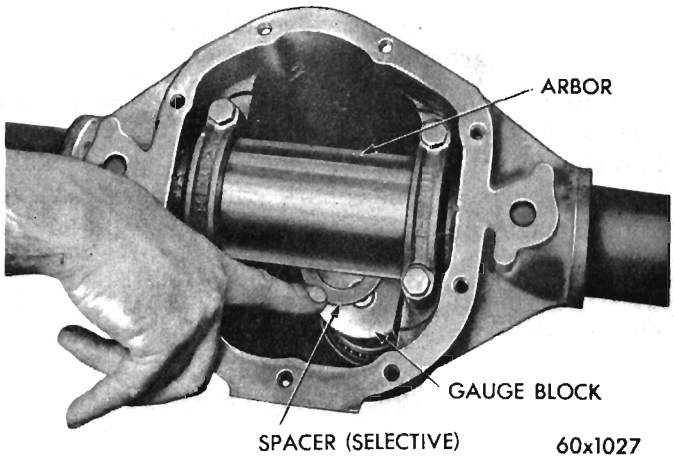


Fig. 58—Measuring Housing for Pinion Spacer Thickness

between the arbor and the gauge block when the washer is flat on the block. The fit should have a definite drag, similar to the pull of a feeler gauge. Should a washer have a little drag and the next thicker washer will not pass through, select the thinner washer, as shown in Figure 58.

The selected washer is the proper one **for this carrier. It would be the proper one for installation with a pinion marked —0.** If the pinion has a +2, marking, select a washer that many thousandths **thinner** for installation. If the pinion has a —2, select a washer that many thousandths **thicker** for installation. Treat other pinion markings in a similar manner. Spacer washers are available in .001 inch variations from .084 to .100 inch.

(4) Remove the tool from the carrier.

24. PINION INSTALLATION AND BEARING PRELOAD

Pinion spacer washers are chamfered on one side and must be installed with the chamfered side toward the pinion head.

(1) Place the selected spacer (Paragraph 8) and the bearing on the pinion. Use installing Sleeve Tool C-3717, to press bearing on pinion, as shown in Figure 59.

(2) Hold the pinion in carrier and install the original preload washer (chamfered side toward shoulder), front bearing, yoke and nut on the pinion.

(3) Turn the housing to bring the nose of the carrier up. Tighten the nut to 240 foot-pounds (minimum), with torque wrench C-485, using holding Tool C-3281, on the yoke to hold the assembly in several positions to make a complete revolution while tightening. Remove the holding tool and rotate the assembly several turns in both directions to align the bearing rollers.

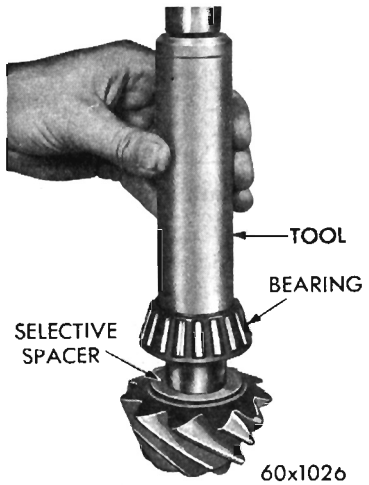


Fig. 59—Installing Pinion Spacer and Rear Bearing

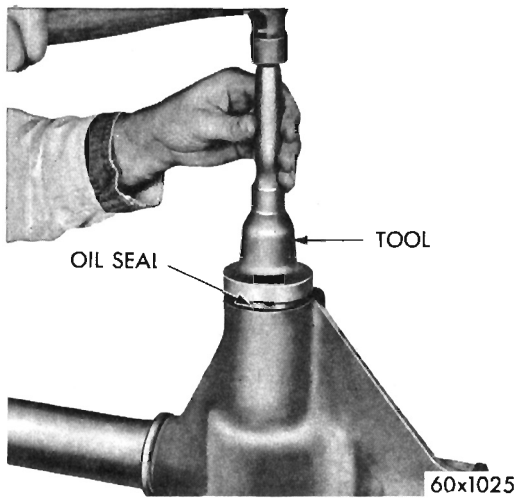


Fig. 60—Installing Pinion Oil Seal

(4) Use an inch-pound torque wrench Tool C-685 to measure the preload. Accurate readings can be obtained only with the nose of the carrier up. With the handle of the wrench floating, take reading when the wrench is moving through several full turns. Correct preload is 15 to 25 inch-pounds. A reading which varies during rotation indicates a binding condition which should be corrected. Use thinner washer to increase preload and thicker washer to decrease preload. **Always** perform Steps 3 and 4 in exactly the same manner each time to obtain accurate preload readings. Preload washers are available in .001 variations from .074 to .106 inch.

(5) When the preload is correct, remove the nut and yoke.

(6) Apply a thin film of sealing compound to the inner bore of the carrier in the area of the pinion seal.

(7) Install the pinion oil seal (lip toward the pinion

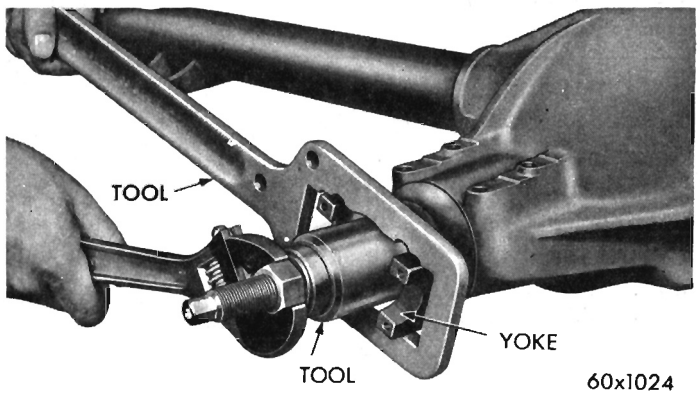


Fig. 61—Installing Pinion Yoke

head) with holding Tool C-3719 to space the seal flange the proper distance from the carrier, as shown in Figure 60.

(8) Install the yoke, using installing Tool C-3718 and Holding Tool C-3281, as shown in Figure 61.

(9) Remove the tools and install the washer (cupped side toward pinion head) and nut. Tighten nut to 240 foot-pounds torque.

25. DRIVE GEAR AND PINION BACKLASH

(1) With the pinion installed and the bearing preload set, install the differential carrier, ring gear, bearings and cups with a .254" spacer on the ring gear side, into the differential housing. Do not install the bearing caps.

(2) Install a spacer on the right side that will leave a little end play.

(3) Measure the end play by using two sets of feeler gauges. Push the differential to the left side or ring gear side of the carrier. Insert a feeler gauge between the spacer and the right side of the casting above the centerline of the case (Figure 56). Insert the same thickness of another set of feeler gauges between the spacer and casting below the centerline of the case. Increase the thickness of the gauges until a heavy drag is felt.

(4) Rotate the differential several times in both directions to seat the bearings and cups and recheck the feeler gauge drag.

(5) Install a spacer totaling the combined thickness of the spacer and feeler gauge. This will provide zero end play.

(6) Measure the drive gear backlash and refer to the "Differential Preload Spacer Selection Chart" for the proper spacers to provide .004" to .007" backlash. Measure the backlash at 90° intervals.

(7) Remove the differential from the carrier housing and install the proper spacers for left and right sides as specified by the "Differential Preload Spacer Selection Chart".

DIFFERENTIAL PRELOAD SPACER SELECTION CHART

Backlash at Zero End Play	Change Left Spacer Thickness by:	Change Right Spacer Thickness by:	Backlash at Zero End Play	Change Left Spacer Thickness by:	Change Right Spacer Thickness by:
.020	+.026	−.016	.010	+.012	−.002
.019	+.024	−.014	.009	+.010	−.000
.018	+.022	−.012	.008	+.008	+.002
.017	+.022	−.012	.007	+.008	+.002
.016	+.020	−.010	.006	+.006	+.004
.015	+.020	−.010	.005	+.004	+.006
.014	+.018	−.008	.004	+.002	+.008
.013	+.016	−.006	.003	+.002	+.008
.012	+.014	−.004	.002	+.000	+.010
.011	+.014	−.004	.001	+.000	+.012

Should the zero end play backlash measure more than .020 (Maximum chart figure) increase the thickness of the left spacer from the specified .254" to a thickness great enough to reduce the zero end play backlash within the chart limits; then follow the recommended procedure.

(8) Attach the spreader Tool C-3721 but do not spread the housing at this time.

(9) Install the dial indicator Tool C-3339 on one side of the housing and as near the centerline as possible. Position the anvil of the dial indicator in contact with the opposite side of the housing (Figure 50).

(10) Observe the dial indicator while tightening the spreader tool. Spread the housing .010 to .015 inch. **Never spread the housing more than .020 inch as the case may take a permanent set.**

(11) Remove the dial indicator.

(12) Hold the bearing cups and the selected spacers on the bearing cones and carefully install the differential assembly into the housing. Be certain the assembly is properly seated into the housing.

(13) Release the spreader tool and remove it.

(14) Install the bearing caps and alternate tightening the bolts to 40 foot-pounds.

(15) Install the dial indicator to the case with the indicator parallel with the drive gear rotation and with the anvil contacting one tooth.

(16) Determine the amount of backlash and mark the tooth.

(17) To find the position of least backlash, take readings on three more teeth approximately 90 degrees apart.

(18) Using the teeth with the minimum backlash, the dial indicator should read .004 to .007 inch. If the reading is not within tolerance it will be necessary to refer to the "Differential Preload Spacer Selection Chart" and install different spacers.

(19) Make a gear tooth pattern test using red lead and refer to the patterns in (Figure 34).

(20) Install the differential cover with a new gasket and tighten the attaching bolts to 20 foot-pounds torque.

26. AXLE SHAFT INSTALLATION

The axle shaft bearing and bearing collar must fit tightly on the axle shaft. Press them into place.

(1) Place the axle shaft retainer plate, gasket, bearing and bearing collar on the axle shaft.

(2) Install a foam gasket Part Number 2070933 at each end of the shim pack and place the assembly on the axle housing studs. Place the brake support plate on the axle housing studs.

(3) Apply grease on the bearing outside diameter for prevention of rust.

(4) Install the new oil seals in the axle shaft housing, using Tool C-3734, as shown in Figure 62.

(5) Carefully slide the axle shaft assembly through the oil seal and into the side gear splines.

(6) Tap the end of the axle shaft lightly to position the axle shaft bearing into the bearing bore and attach the retainer plate to the housing. Tighten the nuts to 35 foot-pounds torque.

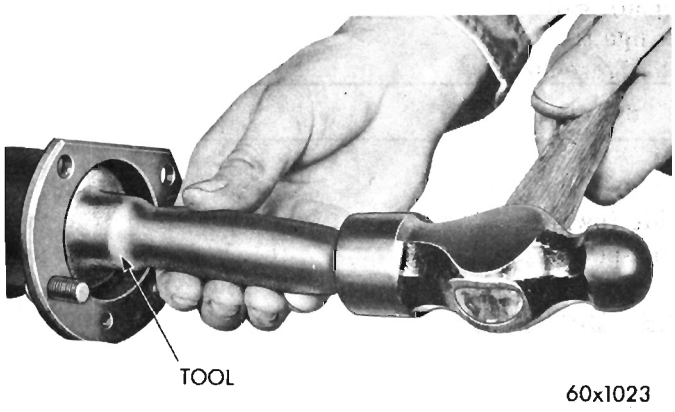


Fig. 62—Installing Axle Shaft Oil Seal

27. AXLE ASSEMBLY—INSTALLATION

(1) With the body supported at the front of the rear springs, position the rear axle housing spring seats over the spring center bolts.

(2) Install the spring clips (U bolts) and shock absorbers. Tighten the U bolt nuts to 45 foot-pounds torque.

(3) Connect the hand brake cable support at the transmission.

(4) Connect the propeller shaft and tighten the nuts to 15 foot-pounds torque.

(5) Connect the brake lines to the wheel cylinders and connect the hydraulic flexible lines.

(6) Install the brake drums and retainer clips.

(7) Install the wheels and tighten the nuts to 55 foot-pounds torque.

(8) Remove the pedal block and bleed the brake system.

(9) Remove the vehicle support stands.

(10) Fill with 2 pints of lubricant: SAE 90 for temperatures above 10°F: SAE 80 from —10°F to —30°F; SAE 75 below —30°F.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
Rear Axle Noise	(a) Wheel loose on axle drum.	(a) Tighten wheel in sequence outlined in "Wheels and Tires."
	(b) Worn drum or worn axle shaft keyways.	(b) Replace drum or axle shaft as necessary.
	(c) Wheel hub bolts loose.	(c) Tighten bolts to correct torque.
	(d) Brinelled or scored wheel bearings.	(d) Replace wheel bearings.
	(e) Insufficient lubrication.	(e) Add lubricant as required.
	(f) Bent axle shaft or wheel and hub.	(f) Replace wheel, hub or drum as necessary.
	(g) Lubricant level low.	(g) Add lubricant as required.
	(h) End play in drive pinion bearing.	(h) Measure and adjust end play.
	(i) Excessive gear lash between drive gear and pinion.	(i) Measure and adjust gear lash.
	(j) Loose drive pinion companion flange nut.	(j) Tighten flange nut to 240 (min.) foot-pounds.
	(k) Damaged gears.	(k) Replace gears as required.
Over-Heating of The Axle Unit	(a) Lubricant level too low.	(a) Add lubricant as required.
	(b) Bearing adjusted too tightly.	(b) Adjust bearings correctly.
	(c) Excessive wear in gears.	(c) Replace excessively worn gears.
Loss of Lubricant	(a) Lubricant level too high.	(a) Remove excessive lubricant.
	(b) Improper type lubricant.	(b) Remove lubricant and replace with the recommended type.
	(c) Clogged breather.	(c) Clean breather thoroughly.
	(d) Oil seals worn or damaged.	(d) Replace seals as required.

GROUP 5
BRAKES
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SPECIFICATIONS
PLYMOUTH

Type	Duo-Servo Single Anchor
Drum Diameter	10 inches
(Police Special)	11 inches
Number of Brake Shoes	8
Width	
Front	2½ inches
Rear	2½ inches
(Police Special)	
Front	3 inches
Rear	2½ inches
Brake Lining (Type)	Bonded Moulded Asbestos
Length & Color Code Markings	
Front Primary	8½" 1 Red and 1 Black mark
Front Secondary	11" 2 Red and 1 Black mark
Rear Primary	8½" 1 Red and 1 Black mark
Rear Secondary	11" 2 Red and 1 Black mark
(Police Special)	
Front Primary	9¼" 3 Black marks
Front Secondary	12⅛" 2 Black and 1 White mark
Rear Primary	9¼" 3 Black marks
Rear Secondary	12⅛" 2 Black and 1 White mark
(Taxi Cab)	
Front Primary	9¼" 1 Black and 2 White marks
Front Secondary	12⅛" 1 White and 1 Green mark
Rear Primary	9¼" 1 Black and 2 White marks
Rear Secondary	12⅛" 1 White and 1 Green mark
Thickness (all)	3/16"
Wheel Cylinder	
Front Wheel Cylinder Bore	1⅛"
Rear Wheel Cylinder Bore	15/16"—13/16"
Master Cylinder Bore	1 inch

*11 Inch Brake

SPECIFICATIONS

VALIANT

Type	Duo-Servo Single Anchor
Drum Diameter	9 inches
Number of Brake Shoes	8
Front	2½" wide
Rear	2" wide
Brake Lining (Type)	Bonded Moulded Asbestos
Length & Color Code Markings	
Front Primary	7⅝" 1 Red and 1 Yellow mark
Front Secondary	9⅝" 2 Red marks
Rear Primary	7⅝" 1 Red and 1 Yellow mark
Rear Secondary	9⅝" 2 Red marks
Thickness (all)	3/16"
Wheel Cylinder	
Front Wheel Cylinder Bore	1"
Rear Wheel Cylinder Bore	13/16"
Master Cylinder Bore	1"

SPECIAL TOOLS

C-416	Clamps—Brake Cylinder Piston
C-650	Hose—Brake Bleeder
C-845	Puller—Wheel
C-3080	Hone—Brake Cylinder
C-3496	Tank—Brake Bleeder
C-3784	Adjuster—Brake Shoe
C-3785	Remover and Installer—Brake Spring
C-3816	Fixture—Piston Assembling

TORQUE REFERENCE

Mounting Bracket to Firewall Nuts	100 in.-lbs.
Master Cylinder to Vacuum Cylinder Nut	100 in.-lbs.
Piston Plate Bolts	55 ft.-lbs.

BRAKES

The 1964 models incorporates the self-adjusting duro-servo two shoe, internal expanding brakes (Figs. 1 and 2), except police cars and Taxi cabs with heavy duty brakes.

SERVICE PROCEDURES

1. BRAKE ADJUSTMENT

Normally self-adjusting brakes will not require a manual adjustment, but in the event of a brake reline it may be advisable to make the initial adjustment manually to speed up the adjusting time.

(1) Raise the vehicle so all wheels are free to turn.

(2) Remove the rear adjusting hole cover from the backing plate on all of the brake supports of the vehicle.

(3) Be sure the parking brake lever is fully released, then back off the parking brake cable adjustment so there is slack in the cable.

(4) Insert the adjusting Tool C-3784, into the star wheel of the adjusting screw. Move the handle of the tool downward until a slight drag is felt when the road wheel is rotated.

(5) Insert a thin screw driver into the brake adjusting hole and the push the adjusting lever out of engagement with the star wheel (Fig. 3), while hold-

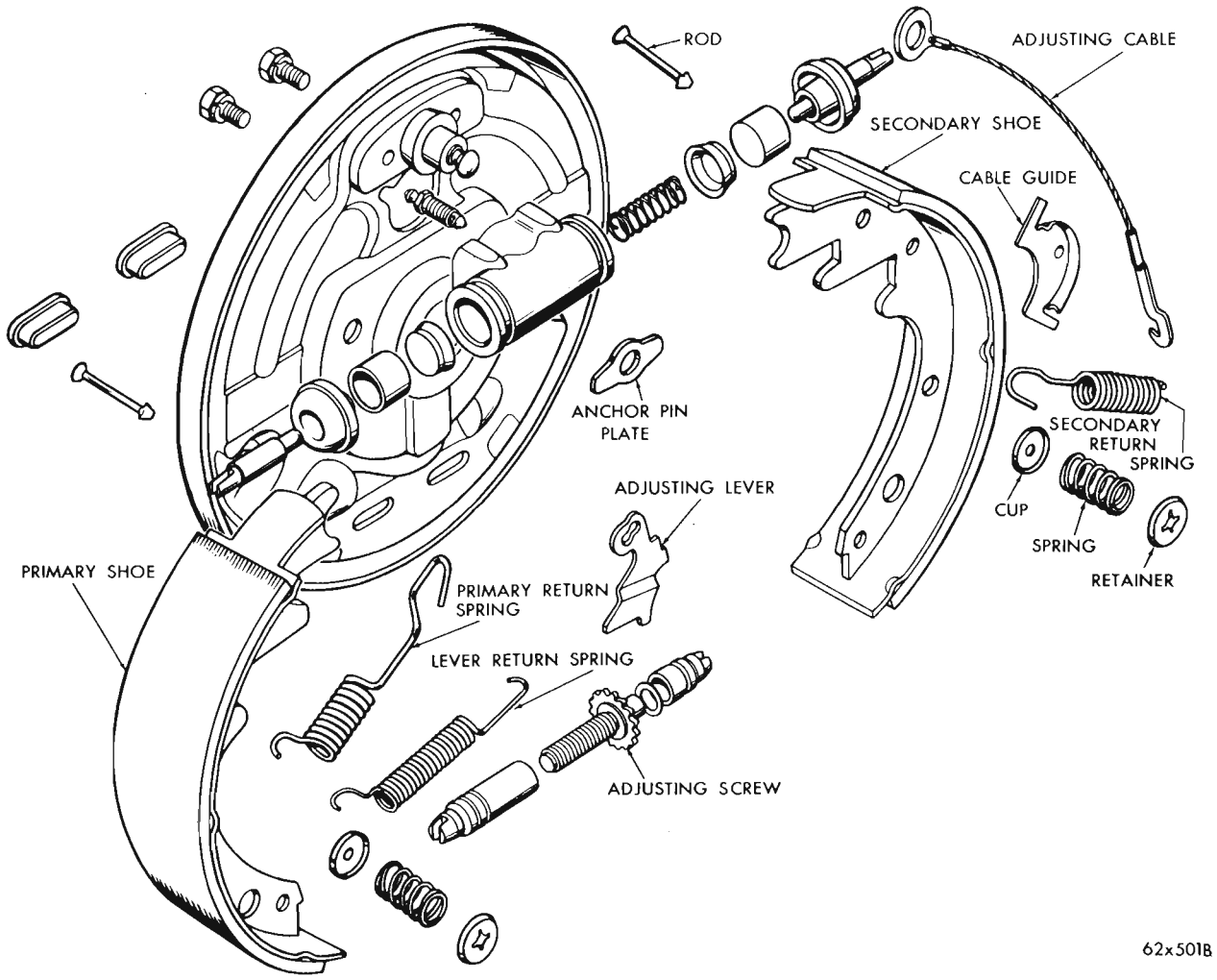


Fig. 1—Front Brake Assembly (Disassembled)

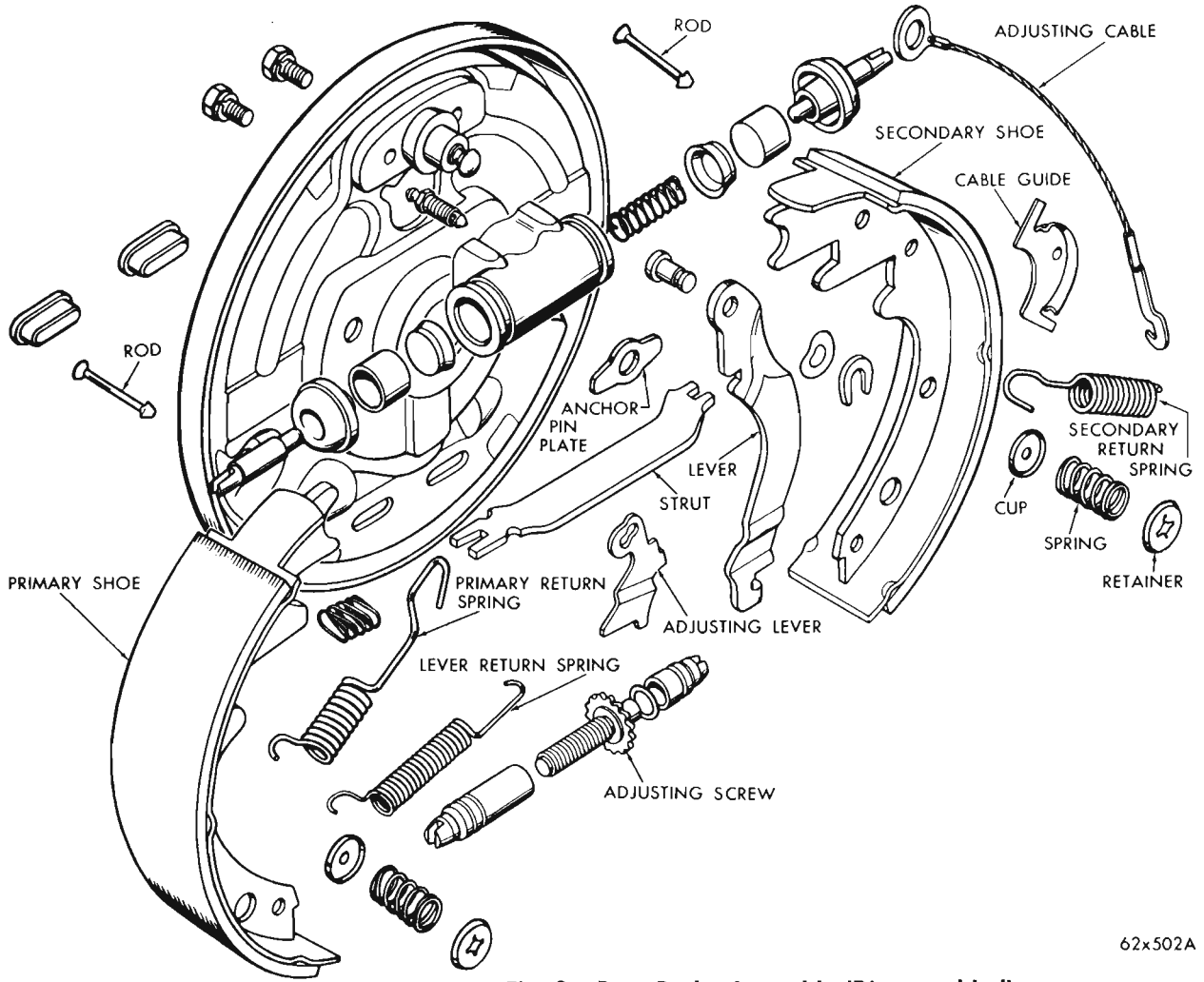


Fig. 2—Rear Brake Assembly (Disassembled)

ing the adjusting lever out of engagement, back off the star wheel 10 to 12 notches to insure a free wheel with no brake shoe drag.

(6) Repeat the above adjustment at each wheel. The adjustment must be equal at all wheels. Install the adjusting hole covers in the brake supports.

(7) Tighten the parking brake cable adjusting nut until a slight drag is felt at the rear wheels, loosen the cable adjusting nut until both rear wheels can be rotated freely, then back off the cable adjusting nut two full turns.

2. TESTING AUTOMATIC ADJUSTER OPERATION

Place the vehicle on a hoist, with a helper in the driver's seat to apply the brakes. Remove the plug from the rear adjustment slot in each brake support plate to observe the adjuster star wheel. Then, to exclude the possibility of maximum adjustment; that is, the adjuster refuses to operate because the closest possible adjustment has been reached; the star wheel should be backed off approximately 30 notches. It will be necessary to hold the adjuster lever away from the star wheel to allow backing off of the adjustment.

Spin the wheel and brake drum in the reverse direction and apply the brakes vigorously. This will provide the necessary inertia to cause the secondary brake shoe to leave the anchor. The wrapup effect will move the secondary shoe and the cable will pull the adjuster lever up. Upon release of the brake pedal, the lever should snap downward, turning the star wheel. Thus, a definite rotation of the adjuster star wheel can be observed if the automatic adjusters working properly. If by the described procedure one or more automatic adjusters do not function properly, the respective drum must be removed for adjuster servicing.

3. BRAKE DRUM

Removal

When the brake drums are removed a thorough inspection of the brake conditions should be made

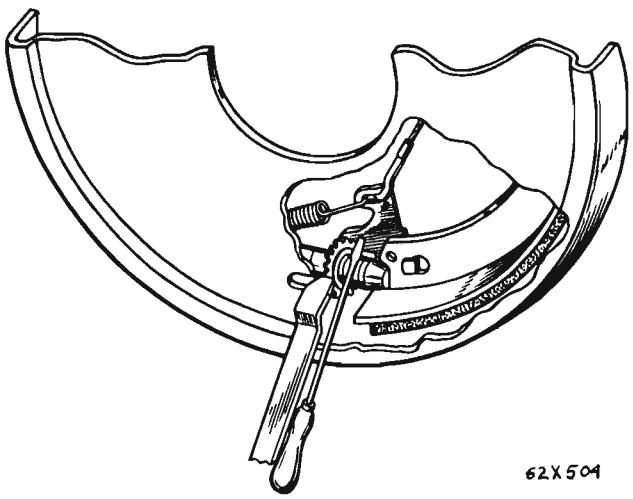


Fig. 3—Releasing Brake Adjustment

Linings should be inspected for wear, saturation by brake fluid or grease and brake shoe alignment. Make all corrections as the inspection indicates.

Front Drum

To aid in brake drum removal, loosen the brake adjustment first.

(1) With the vehicle on a hoist, jack or suitable stands, remove the rear plug from the brake adjusting access hole.

(2) Insert a thin screw driver (Fig. 3) into the brake adjusting hole and push the adjusting lever away from the star adjusting wheel.

NOTE: Care should be taken not to bend the adjusting lever.

(3) Insert Tool C-3784 into the brake adjusting hole and engage the notches of the brake adjusting screw. Release the brake adjustment by prying up with the adjusting tool.

(4) Remove the wheel cover, grease cap, cotter pin, lock, adjusting nut, outer wheel bearing and remove the wheel and drum assembly from the spindle.

Rear Drum

(1) With the vehicle on a hoist, jack, or suitable stands, remove the rear plug from the brake adjusting access hole.

(2) Insert a thin screw driver (Fig. 3) into the brake adjusting hole and hold the adjusting lever away from the notches of the adjusting screw.

(3) Insert Tool C-3784 into the brake adjusting hole and engage the notches of the brake adjusting screw. Release the brake by prying up with the adjusting tool.

(4) Remove the wheel cover, cotter pin and axle nut.

(5) Install rear wheel hub puller Tool C-845, and remove the hub and drum.

4. BRAKE SHOE

Removal

CAUTION: Install brake cylinder piston clamps, Tool C-416 to prevent fluid leakage or air entering the hydraulic system during brake shoe removal.

Removing the Front Brake Shoes

With the vehicle elevated on a hoist, jack or suitable stands, remove the front wheels and drums.

(1) Using Tool C-3785 remove the brake shoe return springs, as shown in Figure 4.

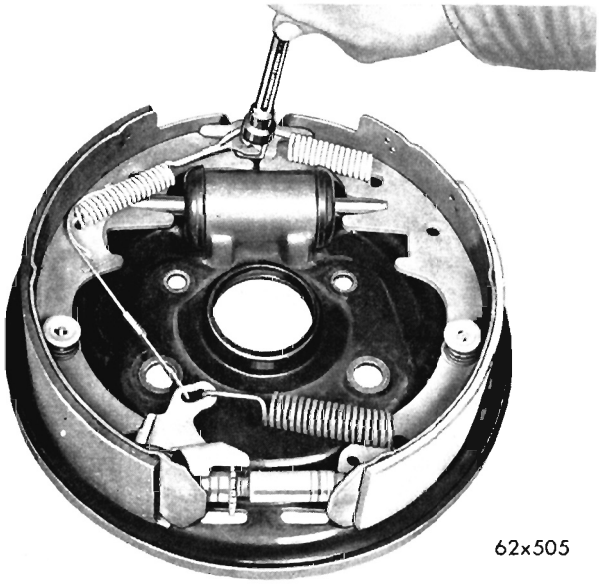


Fig. 4—Removing Brake Shoe Return Springs

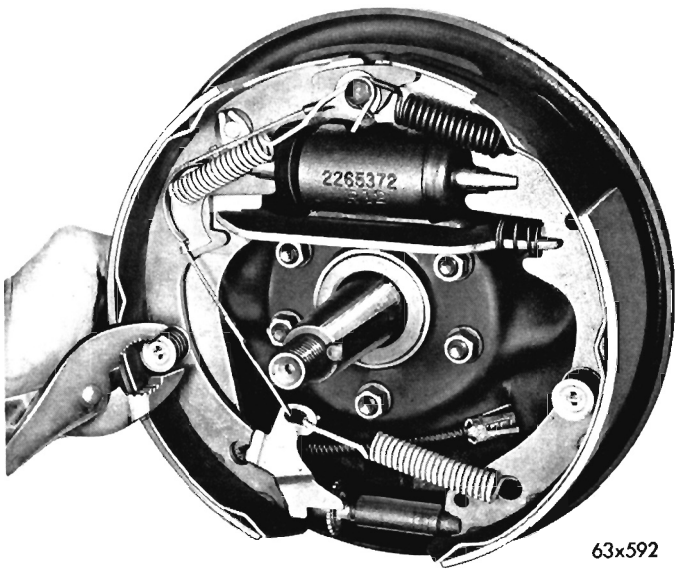


Fig. 5—Removing Retainer Springs and Cups (Plymouth)

(2) Plymouth: Remove the brake shoe retainer, spring and rod, as shown in Figure 1.

Valiant: Insert a small punch into the center of the brake shoe to backing plate retainer spring, and while holding the backing plate retainer clip, press in and disconnect the spring (Fig. 6).

(3) Remove the anchor pin plate.

(4) Remove the primary and secondary shoe assembly from the backing plate.

NOTE: Keep the wheel cylinder assembly compressed with the aid of a brake cylinder clamp until the brake shoes are installed.

(5) Overlap the anchor ends of the primary and secondary brake shoes and remove the adjusting screw, adjusting lever, adjusting spring, cable and cable guide.

Removing the Rear Brake Shoes

(1) Raise the vehicle on a hoist or support on suitable stands.

Plymouth: Remove the hub and drum with Tool C-845.

Valiant: Remove the retaining nuts and remove the wheel, remove tinnerman nuts and remove the brake drum.

(2) Plymouth: Remove the brake shoe retainer, spring and rod as shown in Figure 5.

Valiant: Insert a small punch into the center of the brake shoe to backing plate retainer spring, and while holding the backing plate retainer clip, press in and disconnect the spring (Fig. 6).

(4) Remove the anchor pin plate and tilt the brake shoe assembly out from the backing plate.

(5) Spread the anchor ends of the primary and secondary shoes and remove the parking brake strut and spring.

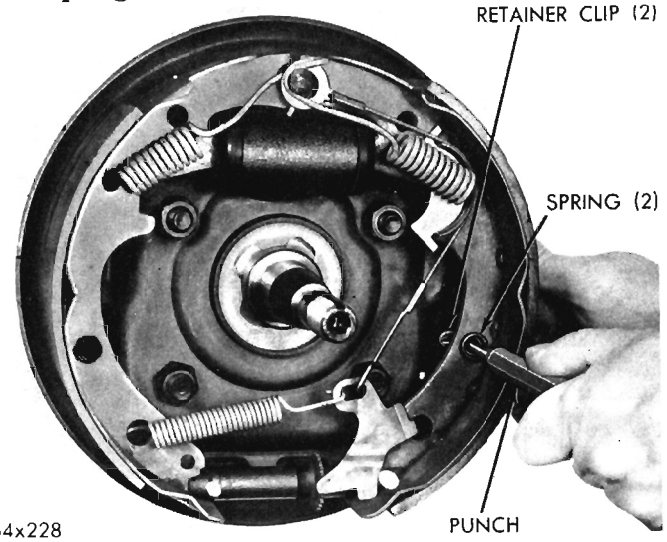


Fig. 6—Removing or Installing Shoe Retainer Spring (Valiant)

(6) Disengage the parking brake cable from the parking brake lever and remove the brake assembly.

(7) Over lap the anchor ends of the primary and secondary shoes and remove the adjusting screw, adjusting lever, adjusting spring, cable and cable guide.

NOTE: Keep the wheel cylinder assembly compressed with the aid of a brake cylinder clamp until the brake shoes are installed.

(8) Remove the brake shoes from the support plate.

(9) Remove the parking brake lever from the secondary brake shoe.

5. INSPECTING THE BRAKE SHOES

Wipe or brush clean (dry) the metal portions of the brake shoes. Examine the lining contact pattern to determine if the shoes are bent. The lining should show contact across the entire width, extending from heel to toe. Shoes showing contact only on one edge should be discarded. Shoes having sufficient lining but lack of contact at toe and heel should be tested for proper grind.

6. GRINDING RECOMMENDATIONS

Brake Shoe Lining—New lining should be measured and ground .060 to .080 inch (maximum) under the drum diameter. The equipment manufacturer's instructions should be followed.

Knowing the drum diameter, the proper measurement is then placed on the grinder and the lining ground to the required clearnaces.

Drum Refacing—Measure the drum runout with an accurate gauge. Drum runout should not exceed .006 inch out of round. If the drum runout is in excess of .006 inch, the drum should be refaced. Remove only as much material as is necessary to clean up the drum.

NOTE: Do not reface more than .060 inch over the standard drum diameter.

7. BRAKE SHOE INSTALLATION

Front Brake Shoes

NOTE: Inspect the backing plate platform for burrs. Remove burrs and apply a light coat of Mopar Sylglyde to the platforms.

(1) Match a primary and secondary brake shoe and place them in their relative position on a work bench.

(2) Lubricate the threads of the adjusting screw and install it between the primary and secondary shoes.

Plymouth: The star adjusting wheels are stamped "R" (right) and "L" (left), and indicate right or left side location. The star wheel must be installed

next to the secondary shoe (Figs. 1 and 4).

Valiant: The star adjusting wheel must be toward the rear of the vehicle on the right side of the vehicle, and toward the front on the left side of the vehicle.

(3) Overlap the anchor ends of the primary and secondary brake shoes and install the adjusting spring and lever.

(4) Spread the anchor ends of the brake shoes to maintain the adjusting lever and spring in position.

(5) Holding the brake shoes in their relative position, place the brake shoe assembly on the backing plate and over the anchor pin (Fig. 7).

(6) Plymouth: Install the brake shoe retainer rods, cups, springs and retainers.

Valiant: Install the brake shoe retaining springs and attach to the retainer clips.

(7) Install the anchor pin plate.

(8) Install the cable guide in the secondary shoe and place the "eye" of the adjusting cable over the anchor pin.

(9) Lubricate the groove of the cable guide and place the adjusting cable over the guide and engage the hook of the cable into the adjusting lever.

(10) Install the return spring into the primary shoe and using Tool C-3785, position spring end of spring anchor.

(11) Install the secondary return spring in the same manner.

(12) Lubricate the wheel bearings and install the brake drum and adjust the wheel bearing. Refer to "Wheels, Bearings and Tires," Group 22.

Rear Brake Shoes

NOTE: Inspect the backing plate platform for burrs. Remove burrs and apply a light coat of Mopar Sylglyde to the platforms.

(1) Place a secondary and a primary shoe in their relative position on a work bench.

(2) Attach the parking brake lever to the back side of the secondary shoe (Figs. 2 and 5).

(3) Lubricate the threads of the adjusting screw and install it between the primary and secondary shoes.

Plymouth: The star adjusting wheels are stamped "R" (right) and "L" (left), and indicate right or left side location. The star wheel must be installed next to the secondary shoe (Fig. 2).

Valiant: The star adjusting wheel must be toward the rear of the vehicle on the right side of the vehicle, and toward the front on the left side of the vehicle.

(4) Overlap the anchor ends of the primary and secondary brake shoes and install the adjusting spring and lever.

(5) Hold the brake shoes in their relative position and engage the parking brake cable into the parking brake lever. Place the brake shoe assembly on the backing plate and over the anchor pin (Figs. 7 or 8).

(6) Plymouth: Install the brake shoe retainer rods, cups, springs and retainers.

Valiant: Install the brake shoe retaining springs and attach to the retainer clips.

(7) Install the parking brake strut and spring between the parking brake lever and the primary shoe.

(8) Install the anchor pin plate.

(9) Install the "eye" of the adjusting cable over the anchor pin and install the small Brake Shoe return spring between the primary shoe and the anchor pin using Tool C-3785.

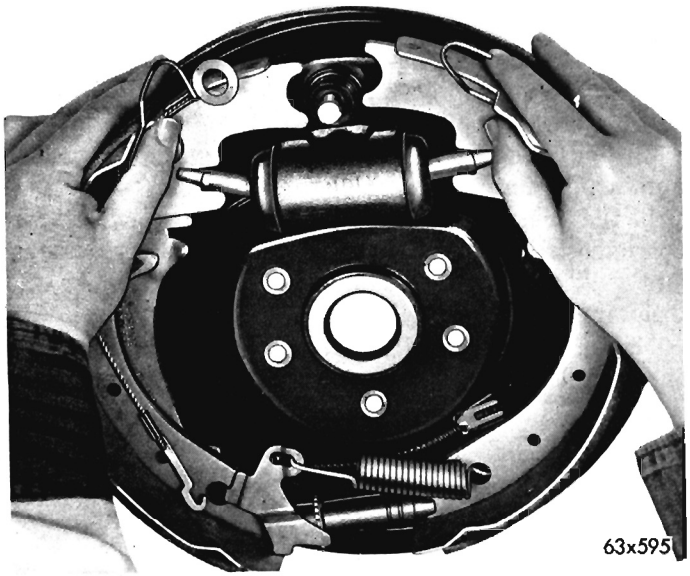


Fig. 7—Installing Brake Assembly to Support Plate

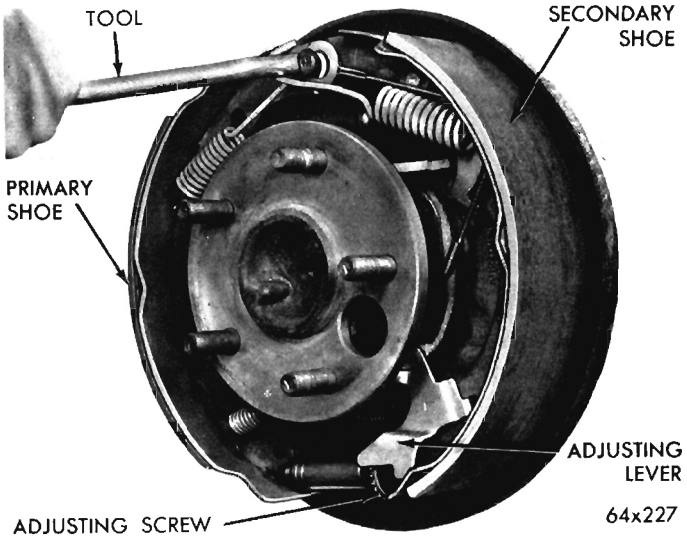


Fig. 8—Assembling Rear Brake (Valiant)

(10) Lubricate the groove of the cable guide and install it in the secondary shoe, and install the secondary return spring with Tool C-3785.

(11) Place the adjusting cable in the groove of the cable guide and engage the hook of the cable into the adjusting lever.

(12) Plymouth: Install the brake drum and tighten the axle shaft nut to 145 foot-pounds torque.

(13) Valiant: Install the brake drum and install the tinnerman nuts to hold the drum in place.

(14) Install the wheels and tighten as outlined in Paragraph 13.

(15) Test the operation of the automatic adjusters and adjust the brakes.

8. BLEEDING THE BRAKE SYSTEM

Clean all dirt and foreign material from the cover of the master cylinder to prevent any dirt from falling into the master cylinder reservoir when the cover is removed.

Using automatic refiller Tool C-837B (with adapter C-3494A) or the one man bleeder tank C-3496 (with adapter C-3494A) provides a convenient means of keeping the master cylinder full while bleeding the hydraulic system. **The brakes may also be bled manually by having an assistant slowly operate the brake pedal while the brakes are being bled. Be certain to refill the master cylinder after bleeding each wheel.**

Tighten the brakes of each wheel until the brakes are locked. (This reduces the movement of the wheel cylinder cups and assists in bleeding.)

Starting with the right rear wheel clean all dirt from the bleeder valve. Place bleeder hose C-650 on the bleeder valve and insert the other end of the bleeder hose in to a clean jar half filled with brake fluid. (This will permit the observation of air bubbles as they are being expelled from the hydraulic system and also prevent air from being drawn back into the system as the brake pedal is released on manual bleeding.) Follow the manufacturer's instructions in the use of bleeder Tools C-837B or C-3496.

When manually bleeding the hydraulic system, push the brake pedal down and let it return slowly, to avoid being drawn into the system. Bleed intermittently, opening and closing the valve about every four seconds. This causes a swirling action in the cylinder and assists in expelling the air. Continue the action until the brake fluid is expelled in a solid stream, without any bubbles.

Continue this bleeding operation on the balance of the wheels starting with the left rear wheel, then the right front and finishing with the left front wheel.

If necessary, repeat this bleeding operation if there is any indication of air (a low, soft or spongy brake pedal) remaining in the hydraulic system. Adjust the brakes.

9. TEST FOR FLUID CONTAMINATION

To determine if contamination exists in the brake fluid, as indicated by swollen, deteriorated rubber cups the following tests can be made.

(1) Place a small amount of the drained brake fluid into a small clear glass bottle. Separation of the fluid into distinct layers will indicate mineral oil content.

(2) Add water to the contents and shake. If the contents become milky, oil is present. If the contents remain clear, it is not contaminated with mineral oil.

CAUTION: Be safe and discard old brake fluid that has been bled from the system. Fluid drained from the bleeding operation may contain dirt particles or other contamination and should not be used again.

10. MASTER CYLINDER

Removal (Fig. 9)

(1) Disconnect the push rod.

(2) Remove the pedal return spring.

(3) Disconnect the brake tube at the master cylinder.

(4) Remove the nuts and bolts that attach the master cylinder. Slide the master cylinder straight out and away from the dash panel or booster.

Disassembly

Clean the outside of the master cylinder thoroughly, then remove the cover and drain all brake fluid. Refer to Figure 9 and disassemble the master cylinder for inspection as follows:

(1) Remove the piston stop flange attaching screws and remove the dust boot, push rod and piston assembly. **(Do not remove the pushrod from the piston.)**

(2) Remove the brass washer between the piston and the cup. Remove the master cylinder cup, spring and valve and seal from the master cylinder.

(3) Wash the master cylinder in a suitable solvent and inspect for a scored or pitted cylinder.

If the master cylinder piston is badly scored or corroded, replace it with a new one. The piston cups and valve assembly should be replaced when reconditioning the master cylinder.

Master cylinder walls that have light scratches or show signs of corrosion, can usually be cleaned up with crocus cloth. However, cylinders that have deep scratches or scoring may be honed, providing the diameter of the cylinder bore is not increased more than .002 inch. A master cylinder bore that does not clean up at .002 inch should be discarded and a new cylinder used. (Black stains on the cylinder wall are caused by the piston cups and will do no harm.)

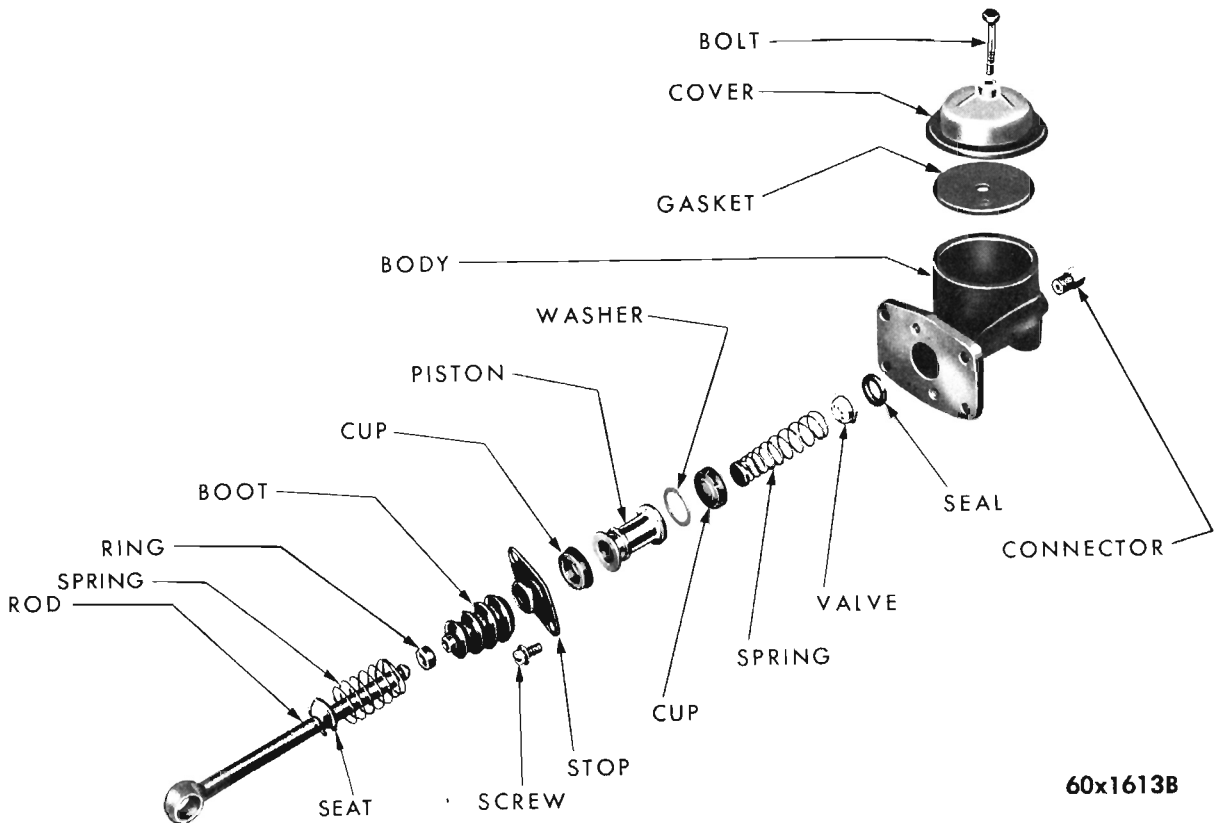


Fig. 9—Master Cylinder Assembly (Disassembled)

NOTE: Use extreme care in cleaning master cylinder after reconditioning. Remove all dust or grit by flushing the cylinder with alcohol; wipe dry with a clean lintless cloth and clean a second time with alchohol. Dry the master cylinder with air pressure, then flush with clean brake fluid. (Be sure the compensator port in the master cylinder bore is open.)

Assembly (Fig. 9)

Before assembling, the piston, cups and valve assembly should be dipped in new MoPar brake fluid.

(1) Install the check valve and spring in the cylinder with the valve toward the outlet of the cylinder.

(2) Install the master cylinder cup in the cylinder with the open end of the cup over the closed end of the return spring.

(3) Install the secondary cup on the master cylinder piston and install the piston and push rod assembly in the cylinder with the flat brass washer between the piston and the cup.

(4) Install the dust boot on the push rod and install the stop flange screws. Install the return spring.

Installation

(1) Position the master cylinder on the dash panel and install the attaching screws.

(2) Attach the brake line to the master cylinder.

(3) Fill the master cylinder and bleed the brake system.

11. WHEEL CYLINDER (Fig. 10)

(1) With all drums removed inspect the wheel cylinder boots for evidence of a brake fluid leak. (A slight amount of fluid on the boot may not be a leak but may be preservative oil used in assembly.)

(2) In the event of a leak, remove the brake shoes (replace if soaked with grease or brake fluid), boots, piston wheel cylinder cups and wheel cylinder cup extenstion spring.

(3) Wash the cylinder with alcohol and inspect the cylinder for scores and pits.

Wheel cylinder pistons that are badly scored or corroded should be replaced. The old piston cups should be discarded when reconditioning the hydraulic system.

Cylinder walls that have light scratches, or show signs of corrosion, can usually be cleaned up with crocus cloth, using a circular motion. However, cylinders that have deep scratches or scoring may be honed, using Tool C-3080, providing the diameter of the cylinder bore is not increased more than .002 inch. A cylinder that does not clean up at .002 inch should be discarded and a new cylinder installed. (Black stains on the cylinder walls are caused by the piston cups and will do no harm.)

Before assembling the piston and new cups in the wheel cylinder, dip them in MoPar brake fluid. If

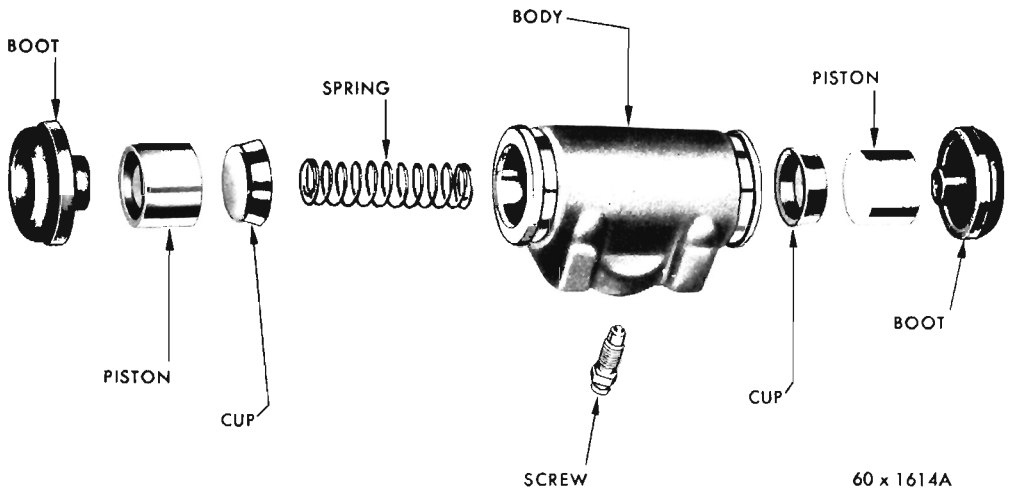


Fig. 10—Wheel Cylinder Assembly (Disassembled)

the boots are deteriorated, or do not fit tightly on the brake shoe pin, as well as the wheel cylinder casting, new boots should be installed.

(4) Wash the wheel cylinder with alcohol and air dry.

(5) Install the expansion spring in the cylinder. Install the wheel cylinder cups in each end of the cylinder with the open end of the cups facing each other.

(6) Install the wheel cylinder pistons in each end of the cylinder with the recessed end of pistons facing the open ends of the cylinder.

(7) Install the boots over the ends of the cylinder. Keep the assembly compressed with the aid of a brake cylinder clamp until the brake shoes are assembled.

12. BRAKE SUPPORT PLATE

Removal (Front Support Plate)

(1) With the wheel and brake drum removed, remove the support plate attaching nuts and washers.

(2) Disconnect the brake line from the brake hose.

(3) Remove the support plate and brake assembly from the spindle.

Removal (Rear Support Plate)

(1) With the wheel and brake drum removed, remove the backing plate attaching nuts and washers.

(2) Remove the rear axle shaft and retainer.

(3) Disconnect the hydraulic brake line from the wheel cylinder.

(4) Disengage the brake cable from the parking brake lever.

(5) Using a suitable tool compress the three flared legs of the cable retainer and pull the brake cable out of the support plate (Fig. 11).

(6) Remove the brake support plate from the rear axle housing.

Installation (Front Support Plate)

(1) With the brake shoes installed on the support plate, apply a small amount of putty type sealing material around the back side of all holes and openings of the support plate to prevent water and dirt from entering the brake assembly.

(2) Place the support plate on the spindle support and install the attaching bolts, nuts and washers. Tighten attaching nuts to 35 foot-pounds torque.

(3) Attach the brake line to the wheel cylinder and tighten to 95 inch-pounds torque.

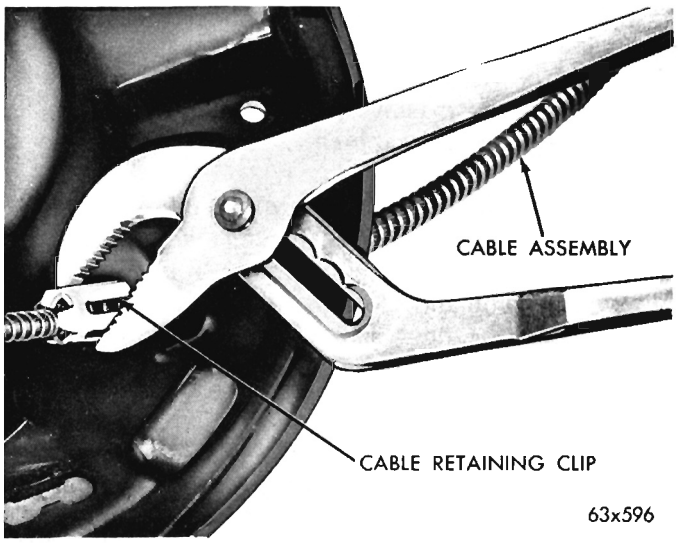


Fig. 11—Removing Brake Cable From Support Plate

(4) Install the brake drum and wheel bearings. Adjust the bearings. Bleed and adjust the brakes.

Installation

(Rear Support Plate)

(1) With the brake shoes installed on the support plate, apply a small amount of putty type sealing material around the back side of all the holes and openings of the support plate to prevent water and dirt from entering the brake assembly.

(2) Install the support plate onto the rear axle housing.

(3) Insert the rear axle shaft and retainer into the housing and install the axle retainer nuts and washers. Tighten the retainer nuts to 35 foot-pounds torque.

(4) Attach the brake line to the wheel cylinder and tighten to 95 inch-pounds torque.

(5) Insert the parking brake cable into the support plate and attach the cable to the parking brake.

(6) Install the brake drum and wheel. Bleed and adjust the brakes.

13. WHEEL STUD TIGHTENING

Tightening sequence and torquing of the wheel stud nuts is of great importance to insure efficient brake operation. The use of an impact or long handled wrench may distort the drum.

A criss-cross tightening sequence should be used, (Fig. 12). Tighten all stud nuts to one-half the specified torque first, (30 ft. lbs.) and then repeat the sequence tightening to the specified 55 foot-pounds torque.

The rear wheel service brakes also act as the parking brakes. The brake shoes are mechanically operated by a lever and strut connected to a flexible steel

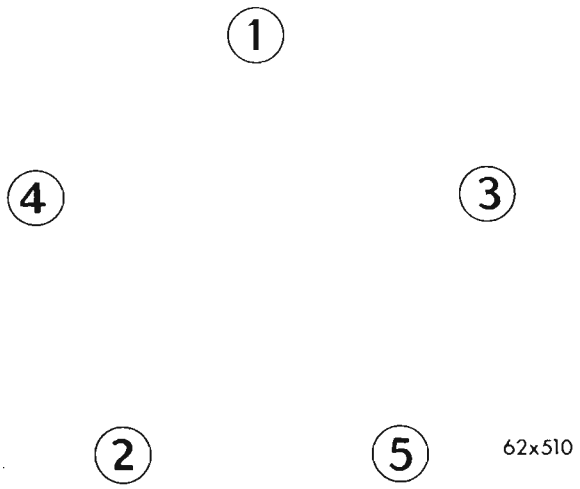


Fig. 12—Wheel Stud Nut Tightening

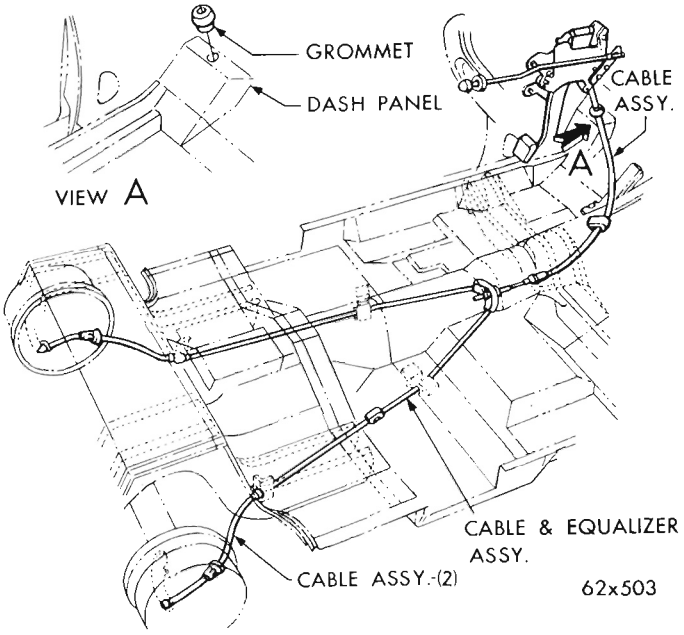


Fig. 13—Parking Brake Cable Routing (Plymouth)

cable. A center steel cable connected to the rear cable equalizer is also connected to the foot or hand operated parking brake lever (Figs. 13 and 14).

14. PARKING BRAKE ADJUSTMENT

The service brakes must be properly adjusted before adjusting the parking brake. Refer to Paragraph 1.

(2) Release the parking brake lever and loosen the cable adjusting nut to insure that the cable is slack (Fig. 13 or 14).

(2) Tighten the cable adjusting nut until a slight drag is felt while rotating the wheel, loosen the cable adjusting nut until both rear wheels can be rotated freely, then back off the cable adjusting nut two full turns.

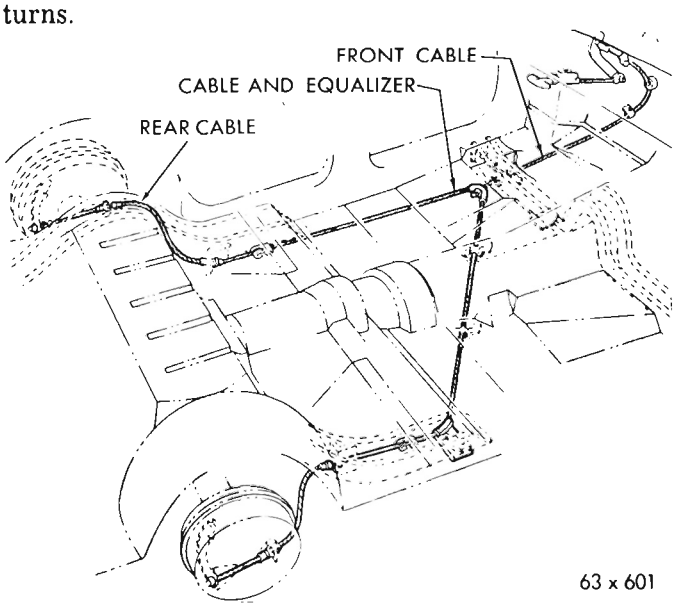


Fig. 14—Parking Brake Cable Routing (Valiant)

(3) Apply the parking brake several times, then release and test to see that the rear wheels rotate freely without dragging on the Brake Shoes.

15. PARKING BRAKE CABLE (Front)

Removal

(1) With the parking brake released, disconnect the front cable from the parking brake equalizer.

(2) Push the foot lever (**Plymouth only**) to the floor and with a screw driver pry the housing and retainer out of the frame crossmember. Withdraw the cable and housing from the crossmember.

(3) Using a screw driver, force the cable and retainer out of the pedal assembly (**Plymouth only**) and work the cable up out of the clevis. On **Valiant models** remove the clevis pin attaching the cable assembly to the parking brake. (Fig. 15 or 16).

(4) Holding the front edge of the floor mat back, force the parking brake cable and housing down and at the same time force the rubber grommet down through the floor pan. Withdraw the assembly from beneath the vehicle **(Plymouth only).** On **Valiant Models** remove the cable assembly by pulling the cable out of the cowl assembly from the engine compartment side.

Installation

(1) Dip the rubber grommet in mineral spirits and install it on the upper portion of the brake cable housing.

(2) Insert the cable assembly from beneath the floor and press the grommet into place in the floor pan **(Plymouth only).** On **Valiant Models** insert the cable through the cowl assembly.

(3) Engage the end of the cable into the parking brake clevis and insert the retaining clip into the anchoring hole of the pedal assembly. Snap the cable housing into place.

(4) Insert the cable through the anchoring hole of the frame crossmember. Insert the retaining clip into the crossmember. Seat the cable housing firmly into place.

(5) Attach the cable to the equalizer and adjust the cable. Apply the brakes firmly several times to seat the housing into the retainer clips. Adjust the brake cable.

16. PARKING BRAKE CABLE (Rear)

Removal

The independent brake cables are attached to an equalizing cable by "C" type brackets, as shown in Figures 13 and 14. The cable is adjusted at the spreader clamp at the center of the equalizing cable.

Should it become necessary to remove the parking brake cable (rear), for installation of a new cable, refer to Figures 13 and 14.

(1) With the vehicle jacked up or on a suitable hoist, remove the rear wheels.

(2) Remove the brake drum from the rear axle.

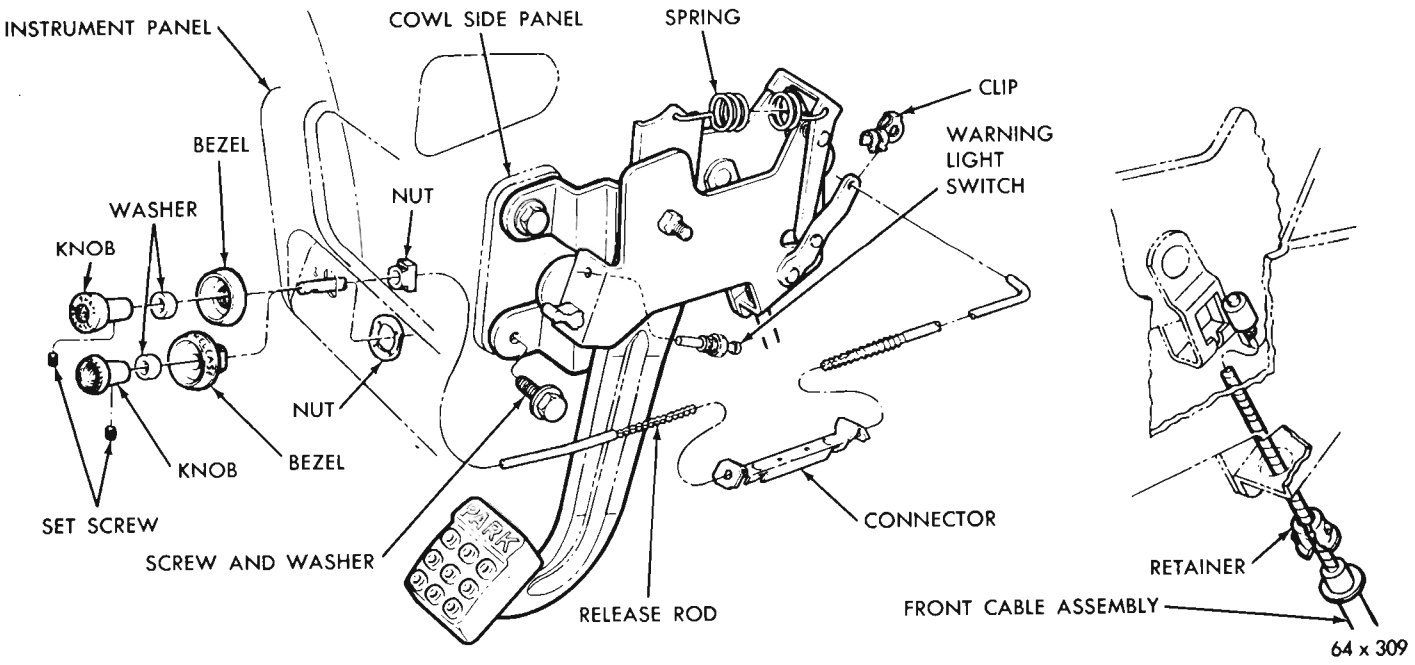


Fig. 15—Parking Brake Pedal (Plymouth)

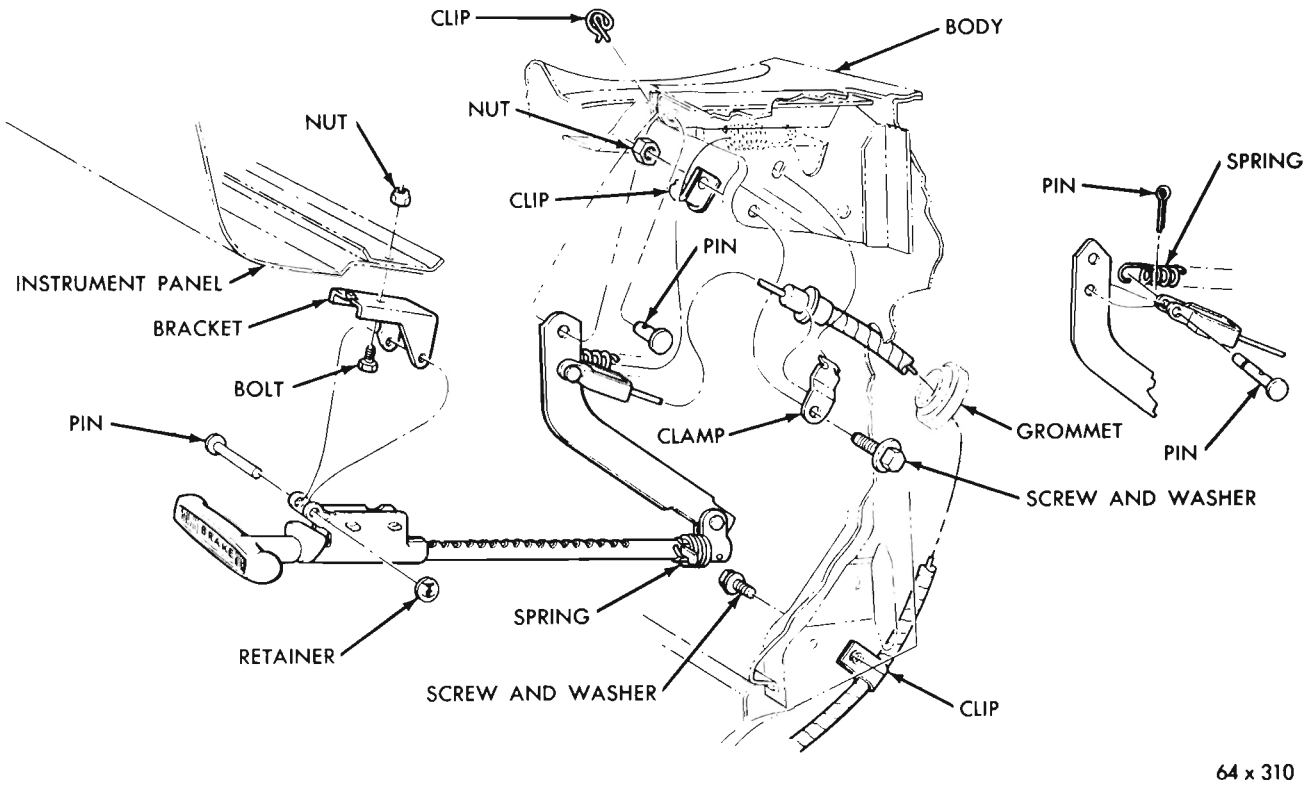


Fig. 16—Parking Brake Lever (Valiant)

(3) Remove the brake shoe return springs.

(4) Remove the brake shoe retaining springs.

(5) Remove the brake shoe strut and spring from the brake back plate and disconnect the brake cable from the operating arm.

(6) Compress the retainers on the end of the brake cable housing (Fig. 11) and remove the cable from the brake plate.

(7) Remove the retaining bolt and nut from the brake cable bracket and remove the cable assembly.

(8) Disconnect the brake cable from the "C" clamp.

Installation

When installing a new brake cable, lubricate the cable with short fibre grease at the points of contact.

(1) Insert the brake cable and housing into the cable bracket and install the retaining clip.

(2) Insert the rear end of the brake cable and housing into the brake backing plate making certain the housing retainers lock the housing firmly into place.

(3) Insert the end of the brake cable into the brake shoe operating lever and install the brake shoes onto the backing plate.

(4) Install the brake shoe retaining springs, return springs and brake drum. Engage the end of the brake cable into the "C" clamp. Install the brake drum and wheel.

(5) Adjust the brakes and cable.

BENDIX SINGLE DIAPHRAGM BOOSTER BRAKE

The Bendix single diaphragm booster brake (Fig. 17) is of the vacuum suspended type and does not require a reserve vacuum tank. This booster utilizes engine manifold vacuum and atmospheric pressure for its power. It is composed of three basic elements to compose a single power unit. The three units are:

(1) A vacuum power section which is composed of a front and rear housing, a power diaphragm, a return spring and a push rod.

(2) A control valve built intergral with the power diaphragm and connected through a valve rod to the brake pedal and controls the degree of brake application or release in accordance with the pressure applied to the brake pedal.

(3) A master cylinder attached to the vacuum power section contains all the conventional elements except the push rod which is a part of the booster brake.

SERVICE PROCEDURES

17. BOOSTER BRAKE

Removal

(1) From within the engine compartment disconnect the brake line from the master cylinder.

(2) Remove the vacuum hose from the booster.

(3) From under the instrument panel remove the brake pedal and push rod attaching bolt and nut.

(4) Remove the four booster-to-dash attaching nuts and remove the booster assembly from the vehicle.

Disassembly

(1) Remove the four master cylinder attaching nuts and remove the master cylinder from the booster.

(2) Remove the dust boot from the back of the booster and remove the air filter and silencers (Fig. 18).

(3) Pry off the retaining ring on the back of the booster and remove the air filter and silencers (Fig. 18).

(4) Place the booster assembly in a vise, scribe the front and rear shells for indexing location, then remove the eight front to rear housing screws.

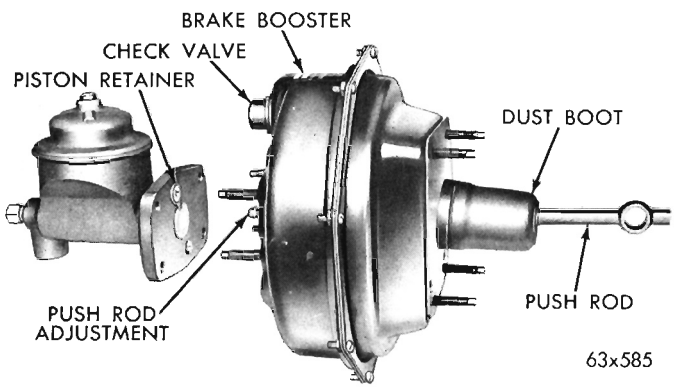


Fig. 17—Power Brake and Master Cylinder

CAUTION: The diaphragm is spring loaded and care should be taken to prevent the front and rear shells from flying apart.

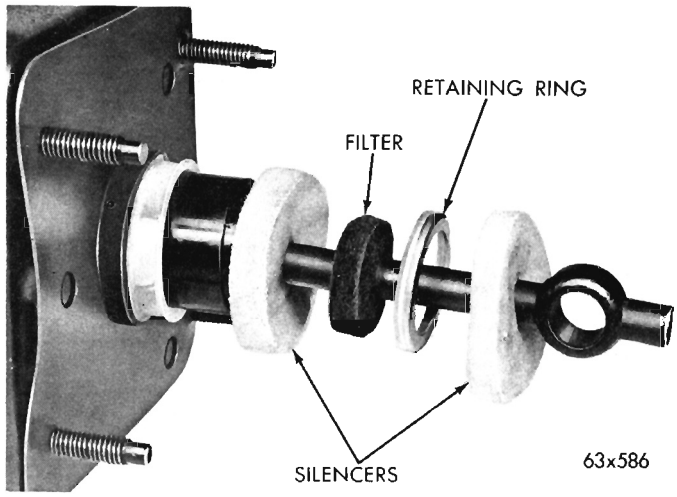


Fig. 18—Air Filters and Silencers

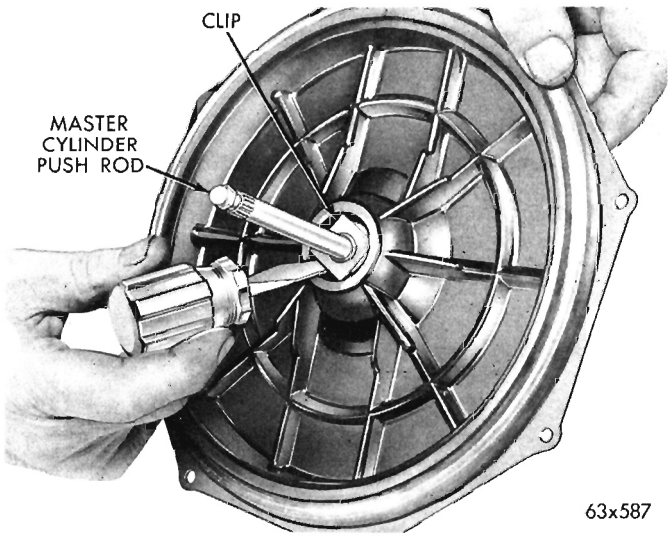


Fig. 19—Removing Push Rod Retainer



Fig. 20—Removing Rubber Diaphragm

(5) Holding the two shells together, remove the booster from the vise and carefully separate the two shells.

(6) Remove the return spring.

(7) Remove the master cylinder push rod retainer (Fig. 19).

(8) Remove the diaphragm and valve assembly from the rear shell.

(9) Place the diaphragm and valve assembly face down and stretch the rubber diaphragm out and over the hub of the valve body (Fig. 20).

(10) Holding the valve housing in a vertical position, press in on the push rod and permit the lock to disengage from the push rod and valve assembly (Fig. 21).

(11) Holding the diaphragm housing, remove the rod and valve assembly (Fig. 22). Remove the rubber valve poppet from the rod.

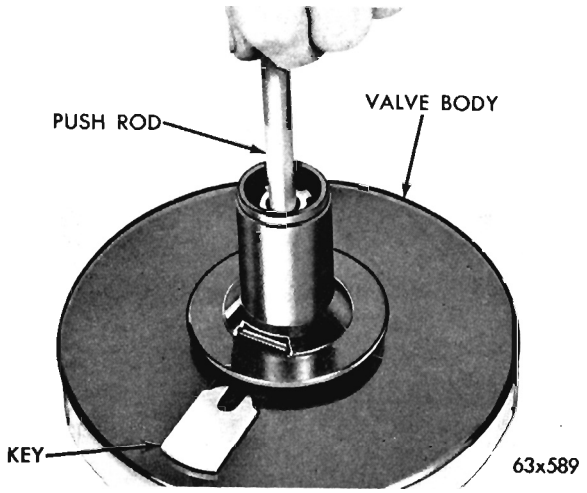


Fig. 21—Removing Push Rod Lock

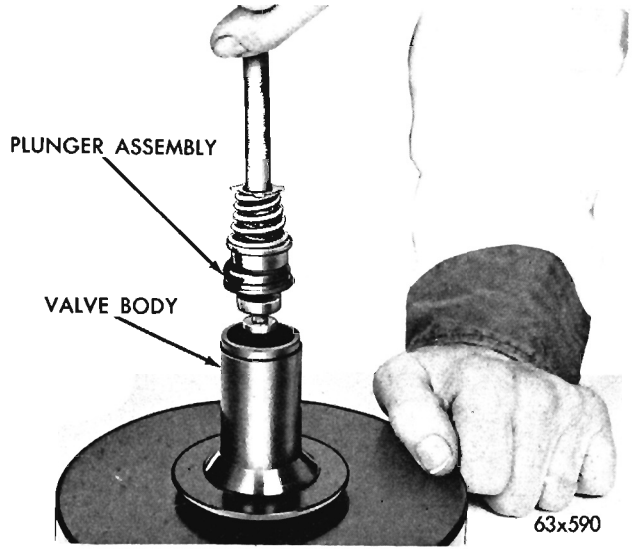


Fig. 22—Removing or Installing Rod and Valve

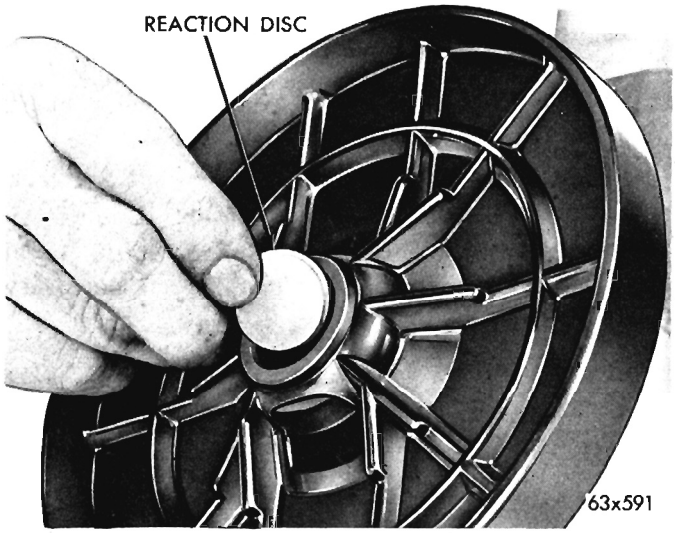


Fig. 23—Removing or Installing Reaction Disc

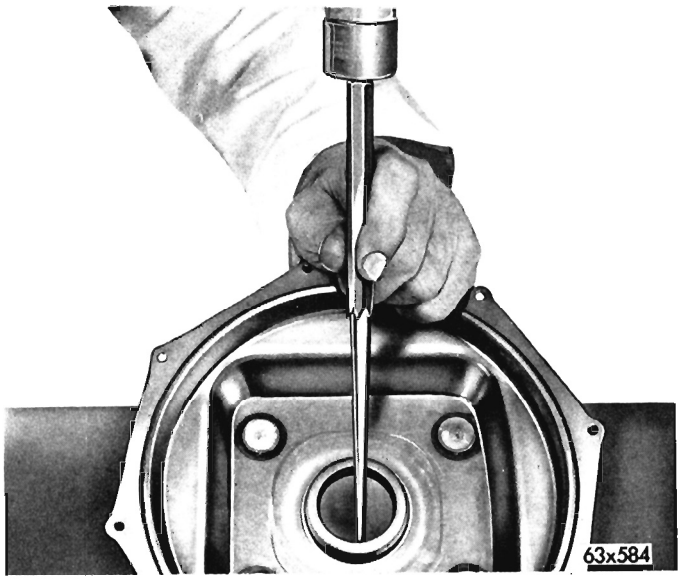


Fig. 24—Removing Rear Seal

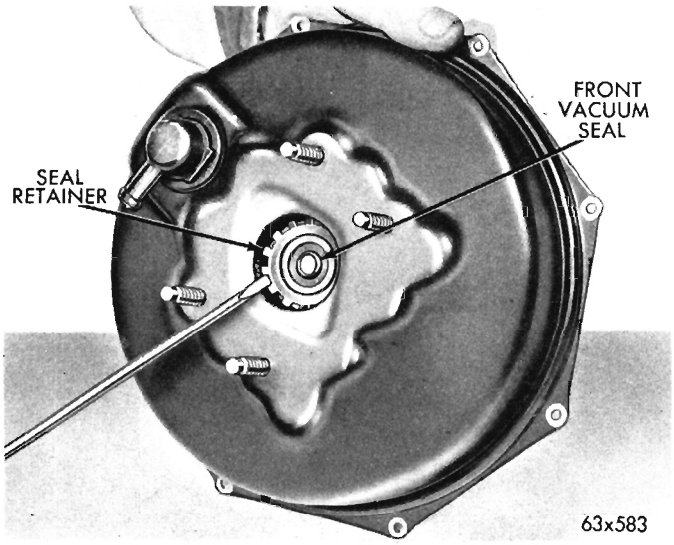


Fig. 25—Removing Front Seal and Retainer

(12) Press out the reaction disc (Fig. 23) from the diaphragm plate.

(13) Support the rear shell on two wooden blocks and drive out the rear seal (Fig. 24).

(14) Using a thin screw driver, pry out the front seal retainer and remove the front seal (Fig. 25).

(15) Thoroughly clean with mineral spirits or alcohol, all parts; recondition or replace as necessary.

Inspection

Inspect all parts for excessive wear. Replace any damaged, worn or chipped parts. Inspect master cylinder bore for scoring, rust, pitting or etching. Recondition or replace as necessary.

Assembly

(1) Press a new seal into the rear housing until the seal is flush with the housing.

(2) Install the front seal and retainer.

(3) Install the reaction disc into the diaphragm plate.

(4) Install the valve poppet and the rod and valve assembly.

(5) With the valve housing supported on a flat horizontal surface, press down on the plunger rod and insert the lock into the housing and valve assembly.

(6) Dip the diaphragm in mineral spirits and install on the plate and valve body.

(7) Install the diaphragm and valve body into the rear housing.

(8) Install the master cylinder push rod and retainer.

(9) Supporting the rear housing on blocks or a vise, install the return spring with the small end toward the front of the booster assembly.

(10) Place the front housing on the return spring and compress the spring, (guiding the master cylinder push rod through the front seal).

(11) Align the scribe marks and install the housing attaching screws finger tight and then progressively tighten.

(12) Install the air filter, silencer and retaining ring.

(13) Install the master cylinder on the brake booster assembly.

Installation

(1) Insert the booster push rod through the mounting hole of the dash panel and attach the booster assembly.

(2) Install the dust boot over the plunger and insert the spacing washer between the plunger and the brake pedal.

(3) Install the plunger and pedal attaching bolt and nut.

(4) Install the vacuum hose to the booster assembly.

(5) Fill and bleed the master cylinder. Attach the brake line to the master cylinder.

(6) Fill the master cylinder and bleed the hydraulic system.

(7) Start the engine and test the booster for operation.

MIDLAND ROSS POWER BOOSTER BRAKE

The Midland Ross power booster brake (Fig. 26) is located on the engine side of the dash panel. The forward portion of the vacuum cylinder is die-cast and supports the master cylinder. The power booster derives its power from intake manifold vacuum and atmospheric pressure. It does not require a vacuum reservoir.

SERVICE PROCEDURES

18. BOOSTER BRAKE

Removal

(1) With the engine turned off, apply the brakes several times to balance the internal pressure of the booster brake.

(2) Disconnect the hydraulic brake line from the master cylinder.

(3) Disconnect the vacuum hose from the vacuum booster.

(4) From under the instrument panel, remove the nut and attaching bolt from the plunger and brake pedal linkage.

(5) Remove the four booster attaching nuts and washers.

(6) Remove the booster and master cylinder from the vehicle and place on a service bench for further disassembly.

Disassembly

(1) Remove the four master cylinder attaching nuts and remove the master cylinder.

(2) Scribe an aligning mark across the joint of the front and rear portions of the booster assembly. This will insure alignment on reassembly.

(3) Remove the dust boot from the operating rod.

(4) Remove the two filter cover retaining screws.

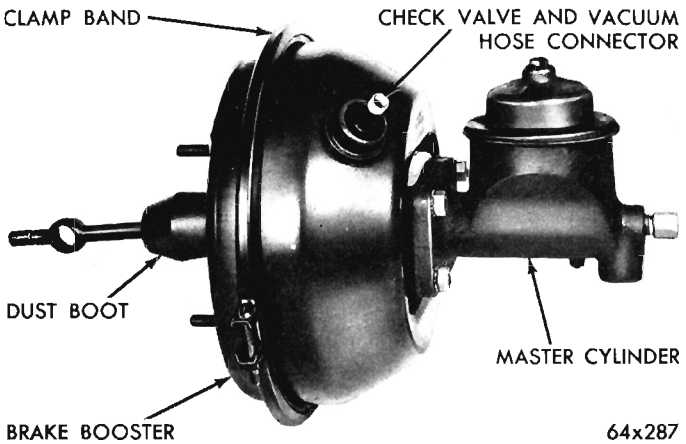


Fig. 26—Power Brake and Master Cylinder

(5) Remove the filter cover and filter.

(6) Working from the front of the unit, push the outer lip of the bellows assembly into the vacuum chamber (Fig. 27).

(7) Remove the clamp band securing the front to the front to the rear housing.

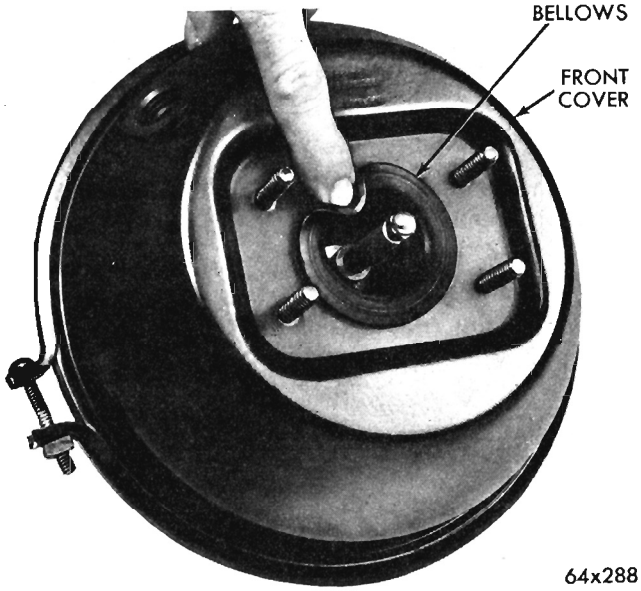


Fig. 27—Unseating the Bellows Seal

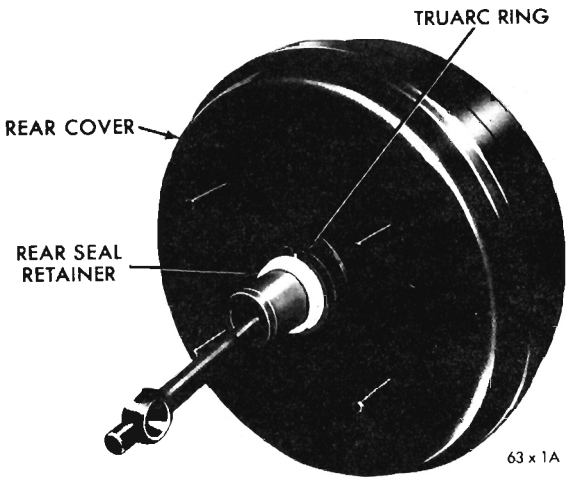


Fig. 28—Rear Seal Retainer

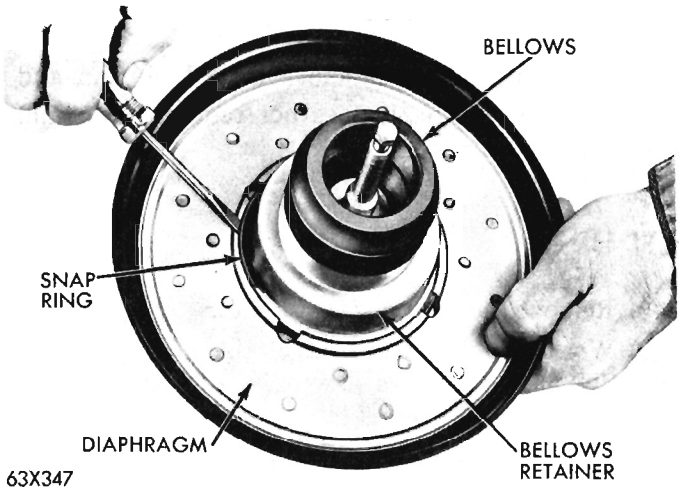


Fig. 29—Removing Bellows Retainer

(8) Using a plastic or rubber hammer tap the outside edge of the rear vacuum housing and separate the housings.

(9) Remove the large snap ring from the rear seal retainer (Fig. 28), and remove the diaphragm, valve housing assembly and rear seal from the rear housing.

(10) Using a screw driver pry out the large retaining snap ring that retains the bellows to the diaphragm (Fig. 29).

(11) Pull the bellows out of the retainer and remove the retaining ring from the bellows.

(12) Slide the master cylinder plunger off. (Fig. 30).

(13) Remove the reaction lever and retainer assembly from the valve body and remove the levers from the retainer (Fig. 31).

(14) Remove the two plastic rings from the plunger shaft.

(15) Remove the retaining clip (Fig. 32) from the plunger shaft, remove the load ring and valve return spring. Remove the valve (Fig. 33).

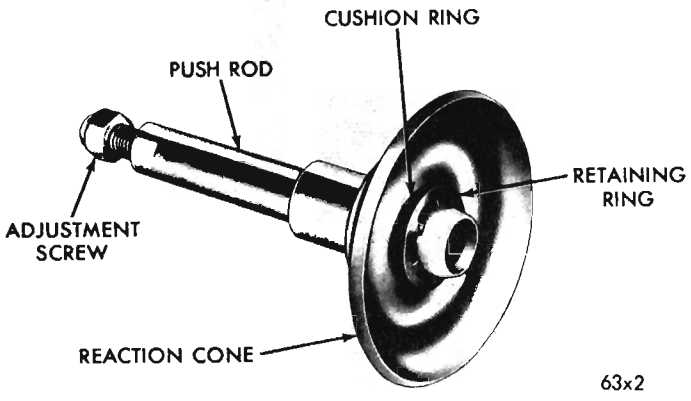


Fig. 30—Master Cylinder Push Rod

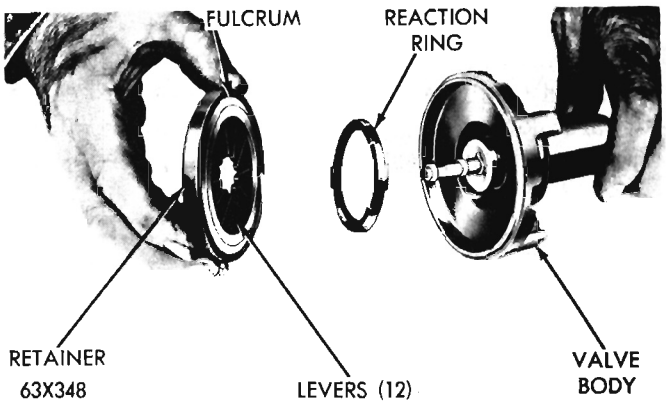


Fig. 31—Valve Body and Reaction Levers

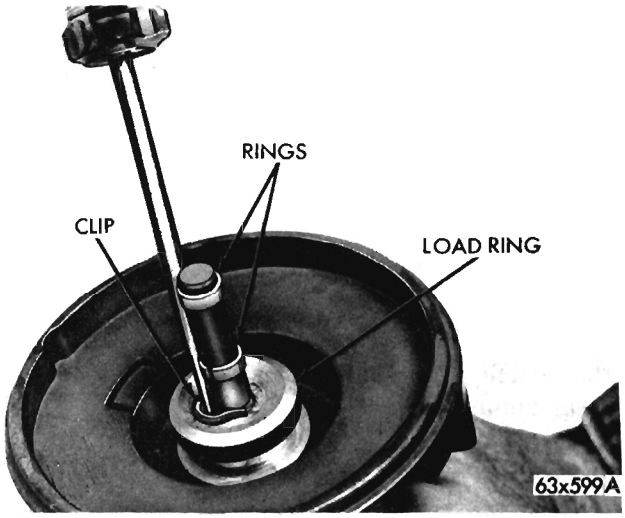


Fig. 32—Removing Valve Retainer

(16) Remove the plunger (Fig. 34) from the valve body.

(17) Remove the rear seal retainer from the plunger.

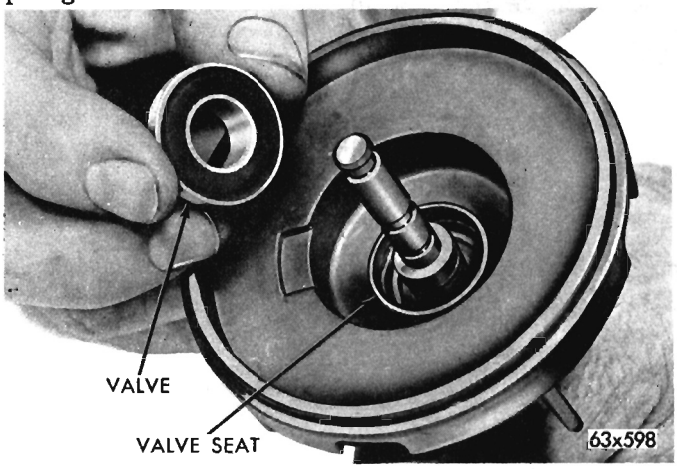


Fig. 33—Removing or Installing Valve

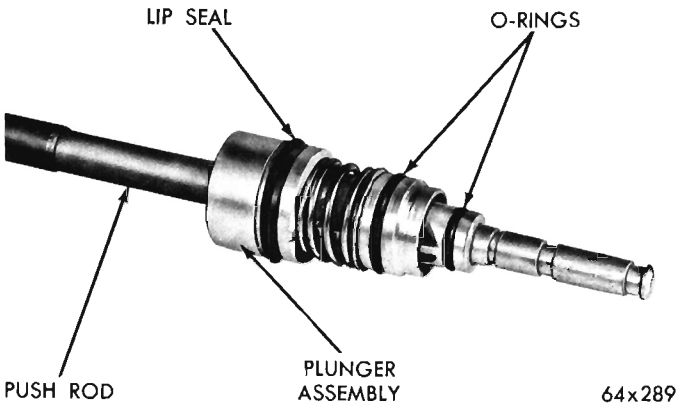


Fig. 34—Valve Plunger Assembly

(18) Using a small screw driver remove the rear seal (Fig. 35) from the rear seal retainer. Remove the "O" ring from the outer diameter of the seal retainer.

(19) Remove the two "O" rings, seal and cushion ring from the plunger (Fig. 34).

(20) Remove the "O" ring from the outside diameter of the valve body.

NOTE: The plunger assembly will be serviced as a unit and need not be dismantled further.

Assembly

Wash all rubber seals in mineral spirits and air dry, relubricate with silicone grease.

(1) Install the "O" ring on the outside diameter of the valve body.

(2) Install the two "O" rings, and seal on the plunger assembly.

(3) Install the cushion ring on the plunger assembly.

(4) Install the rear seal into the rear seal retainer with the lip of the seal toward the small end of the retainer.

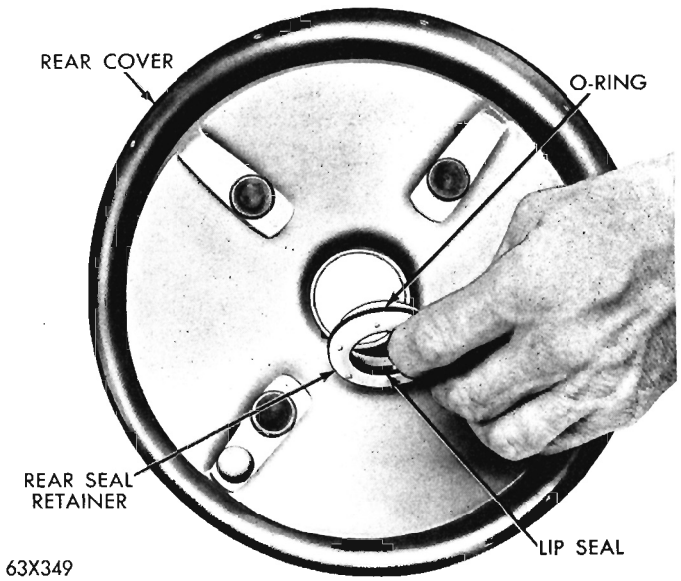


Fig. 35—Rear Seal Assembly

(5) Install the "O" ring on the outside diameter of the rear seal retainer.

(6) Insert the rear seal retainer assembly into the hub of the rear cover.

(7) Holding the seal retainer in place, invert the cover over a wrench socket of sufficient size to support and hold the seal retainer in place.

(8) Apply downward pressure on the rear cover and install the retainer snap ring.

(9) Install the plunger assembly into the valve body.

(10) Install the valve into the valve body with the rubber insert contacting the valve seat. Install the valve return spring over the valve.

(11) Install the load ring onto the plunger with the concave face out.

(12) Press downward on the valve body and insert the spring clip into the groove of the plunger.

(13) Install the levers and fulcrum ring into the rubber retainer.

(14) Align the indexing tab with the notch in the valve body and insert the assembly into the valve body with fulcrum ring on the underside.

(15) Install the two plastic rings onto the plunger shaft.

(16) Install the master cylinder push rod onto the plunger assembly.

(17) Install the bellows into the bellows retainer and install the retaining ring onto the bellows.

(18) Place the valve body assembly into the detents of the diaphragm and install the bellows and retainer assembly.

(19) Install the bellows retainer snap ring.

(20) Install the diaphragm and valve assembly into the rear cover.

(21) Align the scribe marks and place the front cover over the bellows and master cylinder push rod.

(22) Align and squeeze the two housings together, install the clamp band and tighten the clamp bolt.

(23) Pull the lip of the bellows up through the front housing.

(24) Clean the filter and plastic breather.

(25) Install the retaining plate and attaching screws.

(26) **Make sure the master cylinder piston stop and screw are installed in the upper hole on the master cylinder mounting face.** Install the master cylinder on the booster, install the four nuts and tighten to 100 inch-pounds torque.

(27) Install the booster assembly into the dash and tighten attaching nuts.

(28) Connect brake line and vacuum hose.

(29) Refill the master cylinder and bleed the brakes.

BENDIX BOOSTER BRAKE—VALIANT (DEALER INSTALLED)

The Bendix vacuum cylinder is combined with a conventional master cylinder and reduces pedal effort and travel as compared to a non-booster brake system. The reduced pedal travel permits the brake pedal to be positioned in approximately the same plane as the accelerator pedal, reducing the drivers' foot movement.

The master and vacuum cylinder assembly is mounted directly to the engine side of the firewall. The vacuum piston is hooked directly to the suspended brake pedal by a valve operating rod.

SERVICE PROCEDURES

19. REMOVING THE BOOSTER BRAKE FROM VEHICLE

(1) Disconnect vacuum line from vacuum cylinder.

(2) Disconnect hydraulic brake line from master cylinder.

(3) Disconnect wires from stop light switch.

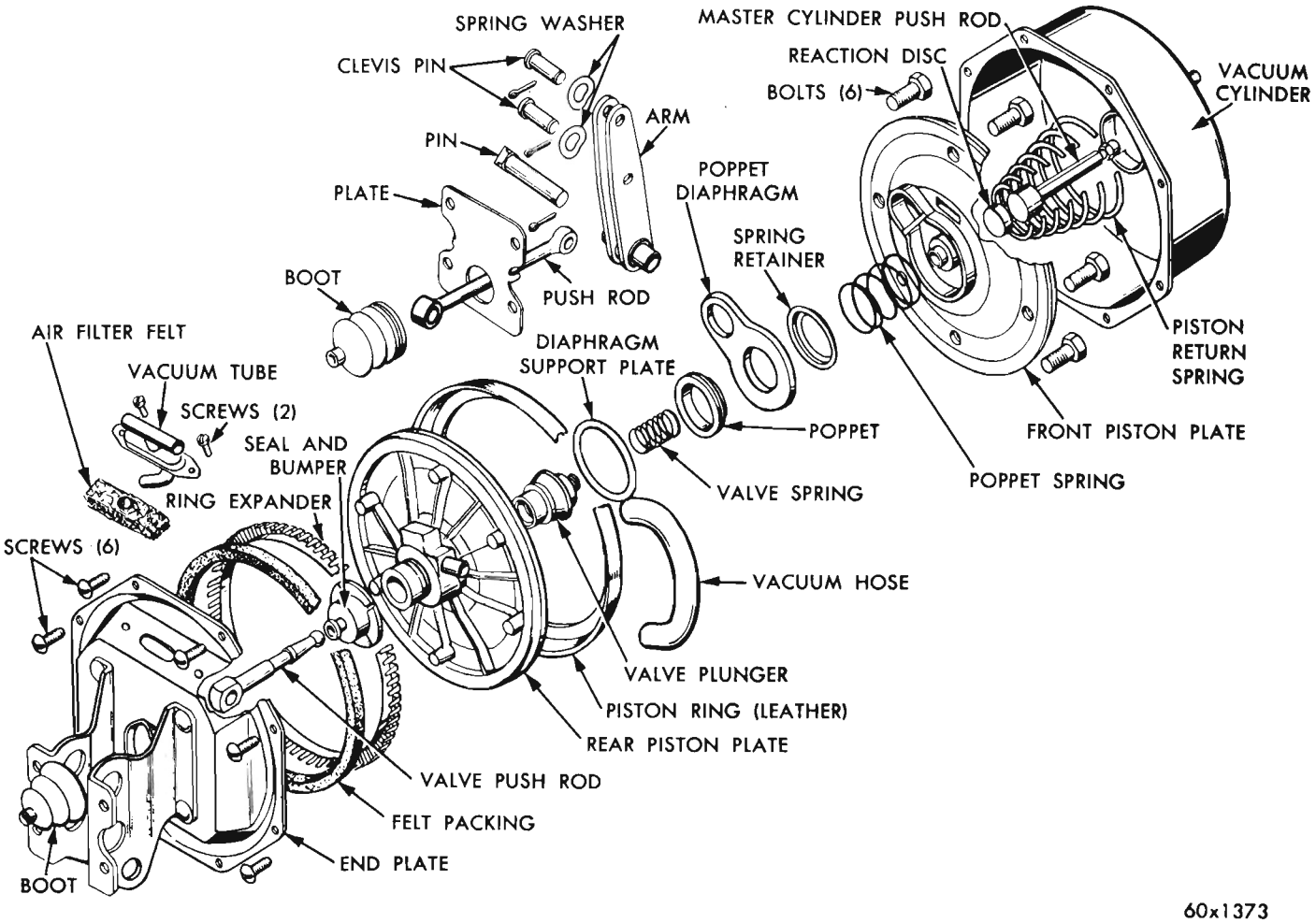
(4) Under instrument panel, disconnect push rod from brake pedal linkage.

(5) Remove four attaching nuts from brake unit mounting bracket and remove unit from car.

20. BOOSTER BRAKE

To disassemble the booster brake unit for repair or overhaul, refer to Figure 36.

(1) Clean all dirt from the master cylinder cover and remove the cover.



60x1373

Fig. 36—Brake Booster Unit (Disassembled)

(2) Apply pressure to the power lever and insert a ⅛ wire or rod in the large hole in the brake reservoir, retaining the master cylinder piston in the cylinder.

(3) Remove the master cylinder from the front end of the vacuum assembly and remove the hydraulic push rod from the booster brake unit.

(4) Remove the cotter pin and clevis pin from the upper end of the power lever (Fig. 36).

(5) Remove the rubber dust cover from the valve rod.

(6) Scribe alignment mark across the end plate and the vacuum cylinder to assure the proper reassembly.

(7) Remove 6 of the 8 end plate attaching screws leaving the 2 remaining screws opposite each other.

(8) Place the vacuum unit on the bench with the end plate up. Apply light hand pressure to the end plate to hold the piston and return spring in place, then remove the 2 remaining end plate attaching screws.

(10) Relax the retaining pressure on the end plate and expose the vacuum piston.

(11) Scribe alignment mark on the face of the piston to coincide with the cover and the cylinder scribe mark, to insure the alignment on the reassembly.

(12) Remove the vacuum hose from the end plate and the vacuum piston.

(13) Remove the end plate, piston and piston return spring.

(14) Remove the air cleaner attaching screws, the air cleaner assembly and the filter from the end plate.

(15) Remove the piston felt and expander ring from the piston assembly.

(16) Remove the seal and bumper from the front of the piston plate.

(17) Place the inverted piston assembly on two wooden blocks and remove the 6 pistons plate bolts (Fig. 37). Hold the piston plates together by hand so the poppet spring and valve return spring do not become dislodged from their relative positions.

(18) Carefully separate the piston plates and remove the leather piston ring.

(19) Remove the poppet spring (outer), valve return spring (inner), the poppet spring retainer, poppet diaphragm and the poppet.

(20) Using a blunt wood rod, push out the rubber reaction disc from the front piston plate. **Do not separate the valve operating rod and valve plunger, as this is serviced as a unit.**

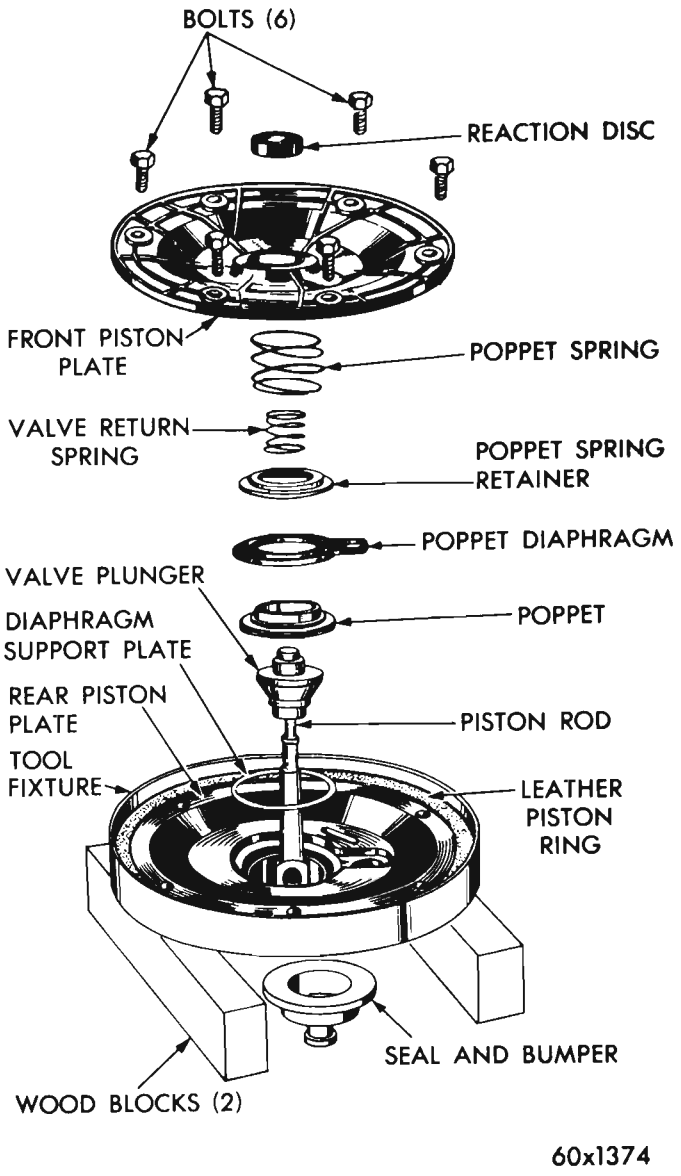


Fig. 37—Brake Booster Piston Unit (Disassembled)

21. CLEANING

Clean all metal parts in a suitable solvent then blow dry with compressed air (including recesses and internal passages). Wash rubber parts in clean alcohol. After parts are cleaned, place on clean paper or cloth and inspect as follows:

22. INSPECTION

Inspect all parts for wear or damage. Replace worn or damaged parts with new parts. Inspect the inside of the vacuum cylinder. If the cylinder is rusted or corroded, polish with fine steel wool or crocus cloth. If inspection reveals nicks or scratches on the piston rod, valve seat (on end of valve rod) or valve seat (at

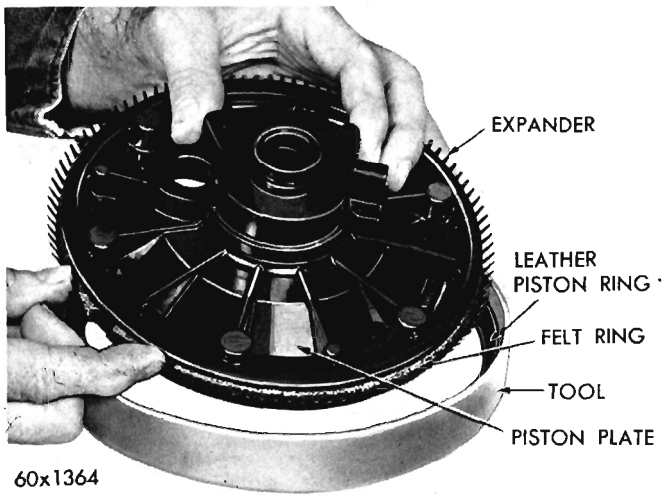


Fig. 38—Assembling Piston Ring, Felt and Expander

center of piston plate) install new parts at assembly as required. Inspect the leather packing and piston rod leather seal. If worn excessively, install new parts as required.

Assembling the Booster Brake

(1) Using vacuum cylinder oil, saturate piston felt and permit excess oil to drip off.

(2) Place the assembly fixture Tool C-3816 on two wooden blocks and insert the leather piston ring in the fixture with the lip side up (Fig. 38).

(3) Assemble the felt ring into the expander and install the expander and the felt in the groove of the rear piston plate.

(4) Hold the felt and the expander compressed in the piston plate and install the rear piston plate into the leather piston ring.

(5) Holding the rear piston plate, felt and leather piston ring into the assembly fixture, invert the assembly and place on 2 wooden blocks.

(6) Apply a light coating of lubricant to the valve plunger and both faces of the reaction disc.

(7) Install the reaction disc in the hub of the front piston (Fig. 37).

(8) Insert the eye end of the valve rod through the hole of the rear piston plate.

(9) Install the diaphragm support in the hub of the rear piston plate.

(10) Place flat side of poppet diaphragm over the flange of the poppet and install the poppet assembly in the recess of the rear piston plate.

(11) Install the poppet spring retainer over the end of the poppet and install the valve return spring and the poppet return spring.

(12) Align the front and rear piston plates and install 6 attaching screws finger tight. Progressively tighten every other screw lightly until all are tightened to 55 inch-pounds torque.

(13) Assemble the air cleaner filter over the vacuum tube of the air cleaner assembly and attach the assembly to the end plate and tighten the attaching screws (Fig. 36).

(14) Install the rubber vacuum hose to the inlet tube of the power piston and align the hose to lay flat against the piston.

(15) Remove the vacuum piston assembly from the assembly ring, and coat the inside of the vacuum cylinder and leather packer ring of piston with a thin coating of vacuum cylinder oil.

(16) Install the end plate over the valve push rod of the piston assembly and attach the vacuum hose to the inlet tube of the air cleaner assembly.

(17) Center the large end of the piston return spring in the vacuum cylinder.

(18) Align scribe marks of the end plate, piston assembly and cylinder, then install the piston and end plate, centering the small end of the return spring on the piston assembly.

(19) Compress the spring and install two attaching screws in the end plate opposite each other.

(20) Install the balance of attaching screws and tighten uniformly.

(21) Install the dust cover over the valve rod and flange of the end plate.

(22) Install the spring washer between the valve push rod and power lever linkage, then install clevis pin and cotter pin.

(23) With a rotating motion install large end of hydraulic push rod into the hub of the front piston plate.

(24) Press and rotate the push rod firmly against the rubber reaction disc to insure the expulsion of any air pocket between the push rod and disc.

Push Rod Adjustment

Unless the hydraulic push rod has been replaced, no adjustment of the push rod should be needed. The self locking screw on the end of the push rod is set to the correct height on original assembly. If the push rod has been replaced or the adjustment altered, adjust as follows:

(1) With the piston assembly free in the cylinder and firmly seated in a released position, hold the push rod seated against the reaction disc and centered in the spring of the cylinder.

(2) Adjust the self-locking screw so that the head

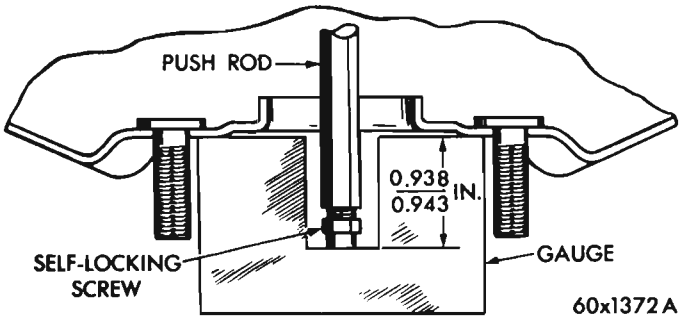


Fig. 39—Adjusting Master Cylinder Push Rod

of the screw is 0.938 to 0.943 inch from the face of the vacuum cylinder (Fig. 39). Fabricate a gauge if necessary to obtain the correct adjustment.

Servicing the Master Cylinder

The service procedures covering the booster brake master cylinder are the same as on the conventional master cylinder. Refer to Paragraph 10.

The master cylinder push rod is a part of the vacuum brake and is not retained in the master cylinder piston. On removing the master cylinder from the brake booster the piston and cups may drop out of the cylinder.

To prevent this from happening;

(1) Clean all the dirt from the master cylinder cover and remove the cover.

(2) Lightly depress the brake pedal and insert ⅛" wire to drill through the large hole in the brake reservoir to retain the piston in the master cylinder.

(3) Proceed with master cylinder reconditioning as recommended in Paragraph 10 if necessary.

(4) After reconditioning, reinstall wire in the inlet port for assembly to brake booster.

(5) Lightly apply pedal and remove the wire from the inlet port and fill master cylinder.

(6) Install the cover and bleed the hydraulic system.

23. INSTALLING THE BOOSTER BRAKE IN VEHICLE

(1) Holding the master cylinder piston into the cylinder as recommended, place the master cylinder on the attaching studs of the brake booster. Tighten nuts to 100 inch pounds torque.

(2) Place the brake booster unit on mounting studs of firewall and install four attaching nuts. Tighten to 100 inch-pounds torque.

(3) Connect the push rod to the brake pedal linkage.

(4) Attach the wires to the stop light switch.

(5) Attach the brake line to the master cylinder.

(6) Attach the vacuum hose to the brake booster.

(7) Remove the retaining wire from port of the master cylinder reservoir.

(8) Fill the master cylinder and bleed the brake system as recommended in Paragraph 8.

SERVICE DIAGNOSIS
PARKING BRAKE

Condition	Possible Cause	Correction
Dragging Brakes	(a) Improper cable or brake adjustment.	(a) Properly adjust the service brakes then adjust the parking brake cable.
	(b) Broken brake shoe return spring.	(b) Replace a broken return spring.
	(c) Broken brake shoe retainer spring.	(c) Replace a broken retainer spring.
	(d) Grease or brake fluid soaked lining.	(d) Replace the grease seal or recondition the wheel cylinders and replace both brake shoes.
	(e) Sticking or frozen brake cable.	(e) Clean and lubricate the cables.
	(f) Broken rear spring.	(f) Replace a broken rear spring.
	(g) Bent or rusted cable equalizer.	(g) Straighten or replace and lubricate the equalizer.
Brake Will Not Hold	(a) Broken or rusted brake cable.	(a) Replace or clean and lubricate the brake cable.
	(b) Improperly adjusted brake or cable.	(b) Adjust the brakes and adjust the parking brake.
	(c) Soaked brake lining.	(c) Replace the grease seal or recondition the wheel cylinders.

SERVICE BRAKE

Condition	Possible Cause	Correction
	(d) Ratchet of pedal mechanism worn.	(d) Replace ratchet mechanism and adjust service brakes and parking brake cable.
Pedal Goes to the Floor	(a) Fluid low in master cylinder.	(a) Fill the master cylinder and bleed the brakes.
	(b) Excessively worn brake lining.	(b) Reline and adjust the brakes.
	(c) Improperly adjusted brake shoes.	(c) Adjust the brakes and fill the master cylinder.
	(d) Leaking wheel cylinders.	(d) Recondition or replace the wheel cylinder and replace both brake shoes.
	(e) Loose or broken brake lines.	(e) Tighten all brake fittings or replace the brake line.
	(f) Air in hydraulic brake system.	(f) Fill the master cylinder and bleed the hydraulic brake system.
	(g) Leaking or worn master cylinder.	(g) Recondition or replace the master cylinder and bleed hydraulic system.
Spongy Brake Pedal	(a) Air in hydraulic system.	(a) Fill the master cylinder and bleed the hydraulic system.
	(b) Improper brake fluid (low boiling point).	(b) Drain, flush and refill with the recommended brake fluid.
	(c) Excessively worn or cracked brake drums.	(c) Replace faulty brake drums.
Brakes Pulling	(a) Uneven tire pressure.	(a) Inflate all tires evenly.
	(b) Incorrect brake adjustment.	(b) Adjust brakes and fill the master cylinder.
	(c) Brake drums out of round.	(c) Grind or replace the brake drums.
	(d) Brake shoes distorted.	(d) Replace the faulty brake shoes.
	(e) Grease or brake fluid soaked lining.	(e) Replace grease seals or recondition the wheel cylinders and replace all contaminated brake lining.
	(f) Unmatched brake lining.	(f) Install matched shoes and lining.
	(g) Restricted brake hose or line.	(g) Replace a plugged hose or brake line.
	(h) Front end out of alignment.	(h) Align the front end.
	(i) Broken rear spring.	(i) Replace the broken spring.
Squealing Brakes	(a) Incorrect brake lining.	(a) Install matched brake lining.
	(b) Dust in brakes or scored brake drums.	(b) Blow out brake assembly with compressed air and grind the brake drums.
	(c) Distorted brake shoes.	(c) Replace the brake shoes.
	(d) Bent support plate.	(d) Replace the support plate.
	(e) Broken or weak brake shoe return spring.	(e) Replace the return spring.
	(f) Weak or broken brake shoe retaining spring.	(f) Replace the retaining spring.
	(g) Glazed brake lining.	(g) Cam grind or replace the brake lining.
	(h) Saturated brake lining.	(h) Replace grease seals or recondition the wheel cylinders and replace the shoes and lining as necessary.

SERVICE DIAGNOSIS
SERVICE BRAKES—(Continued)

Condition	Possible Cause	Correction
Dragging Brakes	(a) Incorrect brake adjustment.	(a) Adjust the brakes and refill master cylinder.
	(b) Parking brakes engaged.	(b) Adjust the parking brakes.
	(c) Wheel cylinder sticking.	(c) Recondition the wheel cylinder.
	(d) Weak or broken brake shoe return spring.	(d) Replace the brake shoe return spring.
	(e) Brake pedal binding.	(e) Free up and lubricate the brake pedal and linkage.
	(f) Master cylinder cup sticking.	(f) Recondition the master cylinder.
	(g) Incorrect master cylinder push rod adjustment.	(g) Properly adjust the master cylinder push rod.
	(h) Obstructed master cylinder relief port.	(h) Use compressed air, blow out relief port.
	(i) Saturated brake lining.	(i) Replace grease seals or recondition the wheel cylinders and replace brake shoes and lining as necessary.
	(j) Bent or out of round brake drum.	(j) Grind or replace the faulty brake drum.
Hard Pedal	(a) Incorrect brake lining.	(a) Install matched brake shoes and lining.
	(b) Incorrect brake adjustment.	(b) Adjust the brakes and refill the master cylinder.
	(c) Frozen brake pedal linkage.	(c) Free up and lubricate the brake linkage.
	(d) Restricted brake line or hose.	(d) Replace the brake line or hose.
	(e) Brake booster inoperative.	(e) Recondition or replace the brake booster.

BOOSTER BRAKES

To determine whether the power unit is functioning, shut off the engine and apply the brakes several times to exhaust the vacuum from the system. Then lightly apply the brakes and start the engine. If the power unit is operating, the brake pedal will move forward slightly and less pedal pressure will be needed to apply the brakes.

If no vacuum assist is felt, inspect the vacuum line for kinks or disconnection. A method of testing for an internal leak in the power unit is to apply the brakes then hold the brakes on and stop the engine. After approximately one minute there should be enough vacuum left to give power assist for several applications.

Wheel Locks	(a) Loose or torn brake lining.	(a) Replace grease seals or recondition the wheel cylinders and replace the brake shoes and lining.
	(b) Incorrect wheel bearing adjustment.	(b) Clean, pack and adjust the wheel bearings.
	(c) Wheel cylinder cups sticking.	(c) Recondition or replace the wheel cylinder.
	(d) Saturated brake lining.	(d) Replace grease seals or recondition the wheel cylinders and replace brake shoes and lining as necessary.
Brakes Fade (High Speed)	(a) Improper brake adjustment.	(a) Adjust the brakes and refill master cylinder.
	(b) Distorted or out of round brake drums.	(b) Grind or replace the drums.
	(c) Overheated brake drums.	(c) Inspect for dragging brakes.

SERVICE DIAGNOSIS

BOOSTER BRAKES—(Continued)

Condition	Possible Cause	Correction
	(d) Incorrect brake fluid (low boiling temperature).	(d) Drain, flush and refill and bleed the hydraulic brake system.
	(e) Saturated brake lining.	(e) Replace grease seals or recondition the wheel cylinders and replace brake shoes and lining as necessary.
Pedal Pulsates Brake Chatter	(a) Bent or out of round brake drum.	(a) Grind or replace the brake drums.
	(b) Rough or scored brake drum.	(b) Grind or replace the brake drum.
	(c) Loose support plate.	(c) Tighten the support plate bolts to the proper torque.
	(d) Bent support plate.	(d) Replace the support plate.
	(e) Distorted brake shoes.	(e) Replace the brake shoes.
	(f) Machine grooves in the contact face of the brake drum.	(f) Grind or replace the brake drum.
	(g) Saturated brake lining.	(g) Replace grease seals or recondition the wheel cylinders and replace the brake shoes and lining as necessary.
Dragging Brakes (All Wheels)	(a) Brake shoes improperly adjusted.	(a) Adjust the brakes.
	(b) Brake pedal linkage binding.	(b) Free up the linkage.
	(c) Excessive hydraulic seal friction.	(c) Lubricate the seal.
	(d) Compensator port plugged.	(d) Clean out the master cylinder.
	(e) Sticking valve plunger.	(e) Free up and lubricate the valve plunger.
	(f) Improper booster push rod length adjustment.	(f) Adjust the push rod.
	(g) Fluid cannot return to master cylinder.	(g) Inspect the pedal return and push rod adjustment.
Grabbing Brakes	(a) Grease or brake fluid on linings.	(a) Inspect for a leak and replace lining as required.
	(b) Sticking actuating valve.	(b) Free up the valve.
Pedal Goes to Floor (Or Almost to Floor)	(a) Self-adjusters not operating.	(a) Inspect the self-adjuster operations.
	(b) Air in hydraulic system.	(b) Fill the master cylinder, bleed the hydraulic brake system.
	(c) Hydraulic leak.	(c) Locate and correct the leak.
	(d) Fluid low in master cylinder.	(d) Add brake fluid and bleed the brakes as necessary.
	(e) Shoe hanging up on rough platform.	(e) Smooth and lubricate the platforms.
Hard Pedal (Power Unit Trouble)	(a) Faulty vacuum check valve.	(a) Replace the check valve.
	(b) Collapsed or leaking vacuum hose.	(b) Replace the hose.
	(c) Plugged vacuum fittings.	(c) Clean out the fittings.
	(d) Leaking vacuum chamber.	(d) Locate and correct the leak.
	(e) Diaphragm assembly out of place in housing.	(e) Position the diaphragm.
	(f) Vacuum leak in forward vacuum housing.	(f) Locate and correct the leak.
	(g) Broken plunger stem.	(g) Replace the plunger stem.

SERVICE DIAGNOSIS

BOOSTER BRAKES—(Continued)

Condition	Possible Cause	Correction
Self-Application of Brakes When Engine Starts	(a) Leak in rear housing.	(a) Locate and correct the leak.
	(b) Diaphragm out of location in housings and allowing atmospheric pressure into rear chamber.	(b) Position the diaphragm.
	(c) Sticking or unseated actuating valve assembly.	(c) Free up the valve and seat the valve properly.
Grunting Noise in Booster on Application	(a) Air in hydraulic system.	(a) Fill the master cylinder and bleed the hydraulic brake system.
	(b) Lack of valve plunger lubrication.	(b) Lubricate the plunger.
	(c) Fluid low in master cylinder.	(c) Add brake fluid and bleed the brakes as necessary.

GROUP 6
CLUTCH
CONTENTS

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SPECIFICATIONS

		(Special Equipment)	(Special Equipment)	
CLUTCH				
Make	Borg & Beck	Borg & Beck	Borg & Beck	Borg & Beck
Model	1505	1506	1570	1594
Type	Single Dry Disc	Single Dry Disc	Single Dry Disc	Single Dry Disc
Vehicle Model Application	All VP-2 Plymouth Models			
Engine Size	318 cu. in.	318 & 361 cu. in.	383 cu. in.	383 & 426 cu. in.
Transmission Type	Standard 3-Speed or 4 Forward Speed Manual Transmission			
CLUTCH DISC				
Facing Type	Moulded Woven Asbestos	Moulded Woven Asbestos	Moulded Woven Asbestos	Moulded Woven Asbestos
Outside Diameter	10"	10½"	10½"	10½"
Thickness	.125"	.125"	.125"	.135"
Disc Springs (number)	10	10	10	10
Disc Spring Color	5 Black 5 Red	5 Green 5 Tan	5 Green 5 Tan	5 Green 5 Tan
CLUTCH COVER				
Pressure Springs (number)	9	9	12	12
Spring Color	No Color	6 No Color 3 White	6 Orange 6 No Color	6 Tan 6 White
Spring Pressure (lbs. @ 1½")	185 ea.	185 ea. 233 ea.	162 ea. 185 ea.	160 ea. 233 ea.
Total Spring Pressure (lbs.)	1770	1920	2205	2511
Number of Levers	3	3	3	3
Height from Face of Flywheel	2"	2"	2"	2"
Lever Setting Gauge Number	20	20	20	20
Pedal Free Play (at clutch fork)	5/32"	5/32"	5/32"	5/32"

SPECIAL TOOLS

DD-286	Clutch Pilot Bushing and Installer	C-585A	Compressing Fixture
C-3005	Torque Wrench	C-585-32	Steel Block
C-3181	Installing and Burnishing Tool	C-585-33	Support Plate
C-3185	Pilot Bushing Remover	C-647	Spring Testing Fixture
C-360	Clutch Disc Aligning Tool	C-730	Pilot Stud
C-41	Pilot Bushing Remover	C-771	Flywheel Turning Tool
C-435	Dial Indicator	C-870	Checking Bar

TORQUE REFERENCE

	Foot-Pounds
Clutch housing to engine bolts	30
Clutch cover to flywheel bolts (5/16")	15
Clutch cover to flywheel bolts (3/8")	30
Clutch pan bolts	100
Clutch fork pivot bolts	15
Flywheel bolt nut	60
Transmission to clutch housing bolts	50
Torque shaft pivot bracket bolts (engine side)	30
Torque shaft pivot bracket bolts (frame side)	15

SPECIFICATIONS

						Special Equip.
CLUTCH						
Make	Borg & Beck	Auburn	Borg & Beck	Borg & Beck	Auburn	Borg & Beck
Model	1574	100306-1	1649	1577	100300	1576
Type	Single Dry Disc	Single Dry Disc	Single Dry Disc	Single Dry Disc	Single Dry Disc	Single Dry Disc
Vehicle Model Applications	All Models—Valiant and Plymouth 6-Cylinder Engines					
Engine Size	170 cu. in.	170 cu. in.	225 cu. in. Taxi	225 cu. in.	225 cu. in.	225 cu. in.
Transmission Type	Standard 3-Speed or 4 Forward Speed Manual Transmission					
CLUTCH DISC						
Facing Type	Moulded Woven Asbestos	Moulded Woven Asbestos	Moulded Woven Asbestos	Moulded Woven Asbestos	Moulded Woven Asbestos	Moulded Woven Asbestos
Outside Diameter	9⅛"	9⅛"	11"	9¼"	9¼"	10"
Thickness	.125"	.114"	.135"	.125"	.114"	.125/.135"
Disc Springs (number)	4	4	6	6	6	6
Disc Spring Color	Chartreuse	2 Orange 2 Green	4 Pink 2 White & Blue	Light Blue	No Color	4 Pink 2 White
CLUTCH COVER						
Pressure Springs (number)	6	3	9	9	3	9
Spring Color	3 White 3 No Color	Black	6 No Color	6 Orange 3 No Color	Red Stripe	White
Spring Pressure (lbs. @ 1½")	233 ea. 185 ea.	196 @ 1.84"	185-233	162 ea. 185 ea.	236 @ 1.81"	233 ea.
Total Spring Pressure (lbs.)	1288	1115	1948	1575	1375	2237
Number of Levers	3	3	3	3	3	3
Height from Face of Flywheel	2"	2"	2"	2"	2"	2"
Lever Setting Gauge Number	19	43	19	43	43	19
Pedal Free Play (at clutch fork)	5/32"	5/32"	5/32"	5/32"	5/32"	5/32"

CLUTCH

The clutch (if so equipped) is of the single dry disc type, with no adjustment for wear being provided in the clutch itself. An individual adjustment is provided for locating each lever in the manufacturing, and should never be disturbed, unless the clutch is to be removed from the car for repair or overhauling.

The 10" Special Equipment Clutch for 6-cylinder models, has special bolts to attach the clutch to the flywheel—**no** lockwashers are used with this assembly.

The Semi-Centrifugal type clutch, for 8-cylinder models, has lighter pressure springs, so that the clutch pedal may be depressed more easily. To compensate for the loss of torque capacity with the use of lighter springs, six cylindrical rollers have been added to the clutch. The rollers wedge themselves between the pressure plate and the clutch cover with a force which increases with engine speed. The wedging action of the rollers applies additional force to the pressure plate to increase the torque transmitting capacity of the clutch.

SERVICE PROCEDURES

Clutch Adjustment in the Vehicle

The only adjustment required while the clutch is in the vehicle is linkage adjustment to obtain the correct amount of clutch pedal free play. Clutch pedal free play is the movement of the pedal required to close the clearance between the throwout bearing and the clutch fingers. Linkage adjustment is required to restore pedal free play when it has been reduced by normal wear of the clutch.

Shorten or lengthen the clutch release fork rod by turning the adjusting nut until there is $\frac{5}{32}$" free movement of the clutch fork outer end. (Refer to Figures 1 or 2, depending on Model.) This adjustment, if correctly set, will give the necessary 1 inch free play at the pedal.

1. CLUTCH

Removal

Improper operation or excessive wear may impair the clutch function to the point which may necessitate its removal and overhaul.

The clutch can be removed only after the trans-

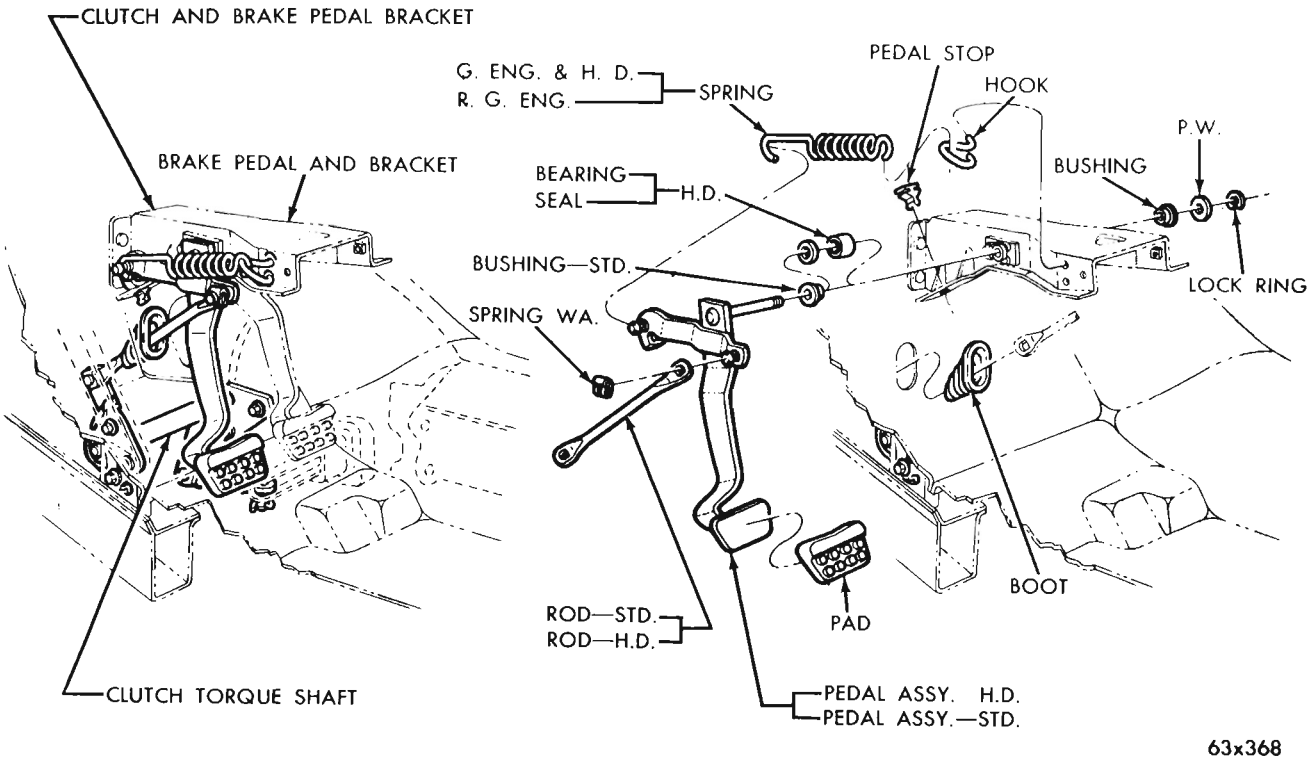


Fig. 1—Clutch Pedal and Linkage (170 Cu. In. Engine)

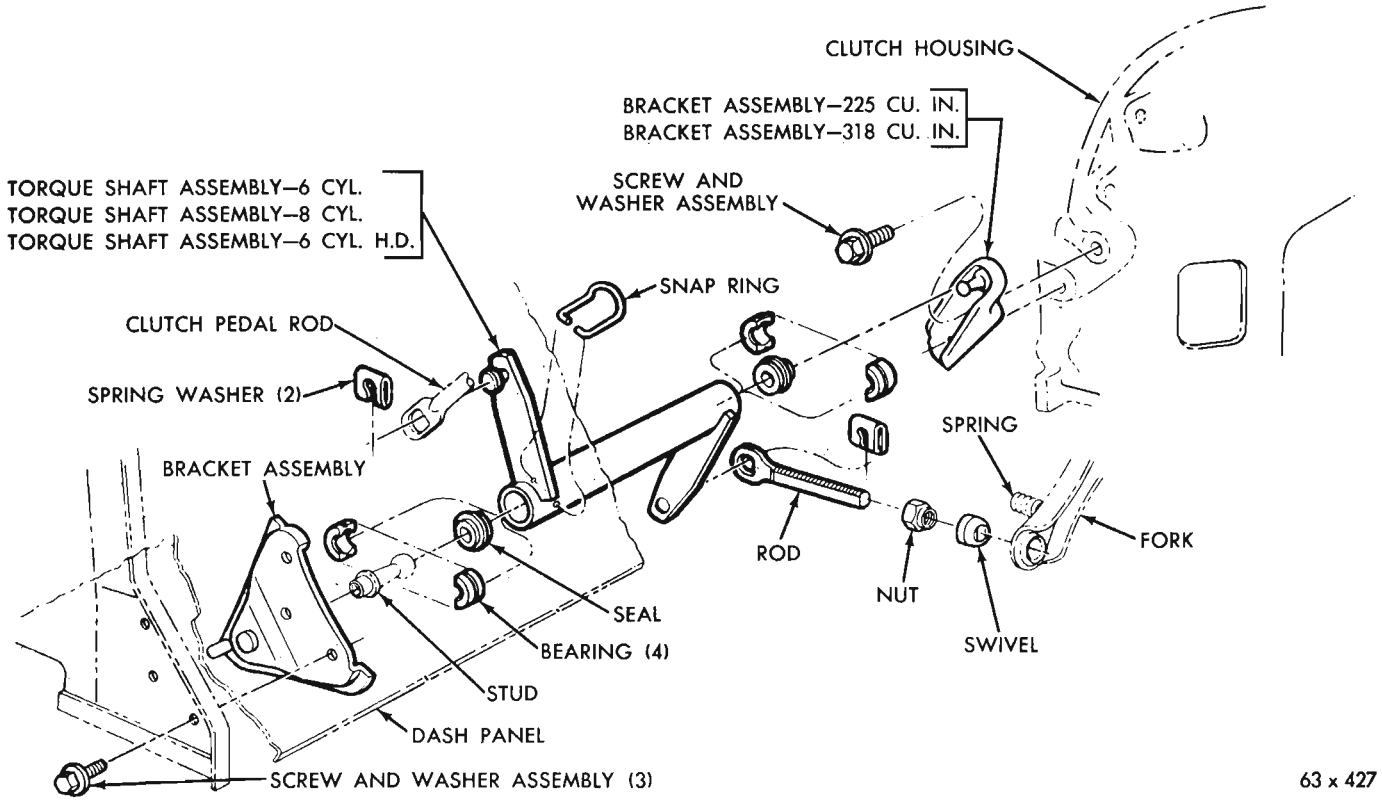


Fig. 2—Clutch Linkage (225 and 318 Cu. In. Engine)

mission has been removed. To remove the clutch, proceed as follows:

(1) Remove the transmission.

(2) Remove the clutch housing pan.

(3) Disconnect clutch linkage and retracting spring at the clutch release fork.

(4) Pull out the clutch release bearing and sleeve.

(5) Mark the clutch cover and flywheel to assure that cover and flywheel will be correctly matched in assembly. Now, remove the bolts that hold the clutch cover to the flywheel, loosening each bolt a few turns (in succession) until cover is free. (See Figure 3.)

(6) The clutch disc and pressure plate assembly can then be removed from the clutch housing. For further disassembly of the clutch pressure plate, refer to Paragraph 2 of this Section.

Installation

When installing the clutch, observe the following precautions:

(1) Coat the clutch shaft pilot bushing (in end of crankshaft) with medium short fibre wheel bearing grease (about a half teaspoon). Place grease in radius at back of bushing.

(2) Clean the surface of the flywheel and pressure plate thoroughly, with fine sandpaper or crocus cloth making certain that all oil or grease has been removed.

(3) Hold the clutch disc, pressure plate and cover in mounting position, with the springs on the disc damper facing away from the flywheel. **Do not touch disc facing, as clutch chatter may result.** Now, insert clutch disc aligning Tool C-360 through hub of disc and into the pilot bushing, as shown in Figure 4. (If

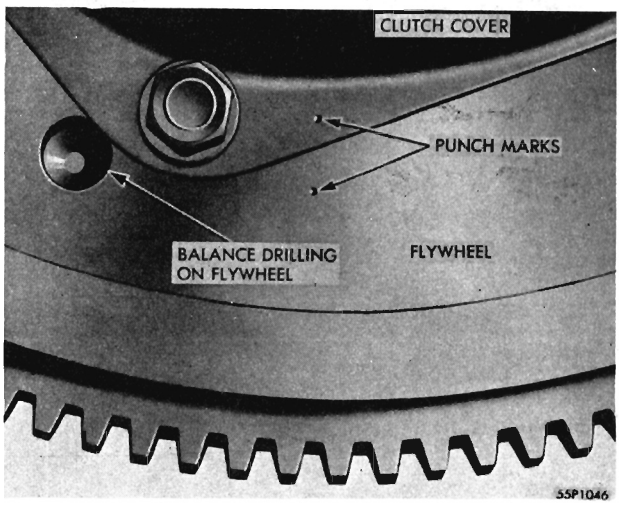


Fig. 3—Punch Marks on Clutch Cover and Flywheel

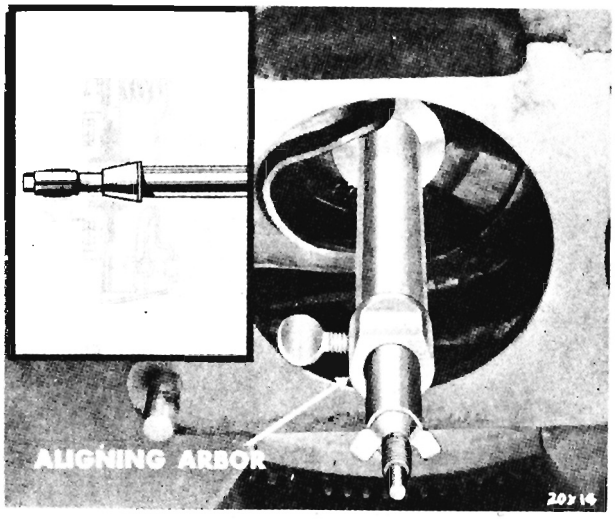


Fig. 4—Clutch Disc Aligning Arbor (Tool C-380)

Tool C-360 is not available, use a spare transmission drive pinion clutch shaft.)

(4) Insert the clutch cover attaching bolts (after aligning balance punch marks) but do not draw down.

(5) To avoid distortion of the clutch cover, the bolts should be tightened a few turns at a time (alternately) until they are all tight. Tighten the bolts. (Refer to Specifications.) Remove Tool C-360 or pinion shaft (if used).

(6) Check the clutch release bearing. If noisy, rough or dry, press off the old bearing and install a new one. Pack the recess in the sleeve (directly behind bearing) with short fibre wheel grease. Coat the fork contact surface on the sleeve and the pivot ball with short fibre wheel grease. Slide the bearing and sleeve up into position, engaging the springs on the sleeve with the fork. **BE SURE THE SPRINGS HAVE LATERAL FREEDOM.** When installing the transmission, **DO NOT LUBRICATE** the pilot shaft or the clutch splines. This area must be kept **DRY.**

(7) Install the transmission by guiding into position with pilot studs Tool C-730. Care should be taken in order not to bend the clutch disc by allowing the transmission to hang. Support the transmission with a suitable jack, then slide into place and secure with bolts.

(8) Adjust clutch linkage (refer to General Information).

2. SERVICING THE CLUTCH COVER (All Borg and Beck)

With the clutch cover and pressure plate removed from the car, refer to Figures 5 or 7, then proceed as follows:

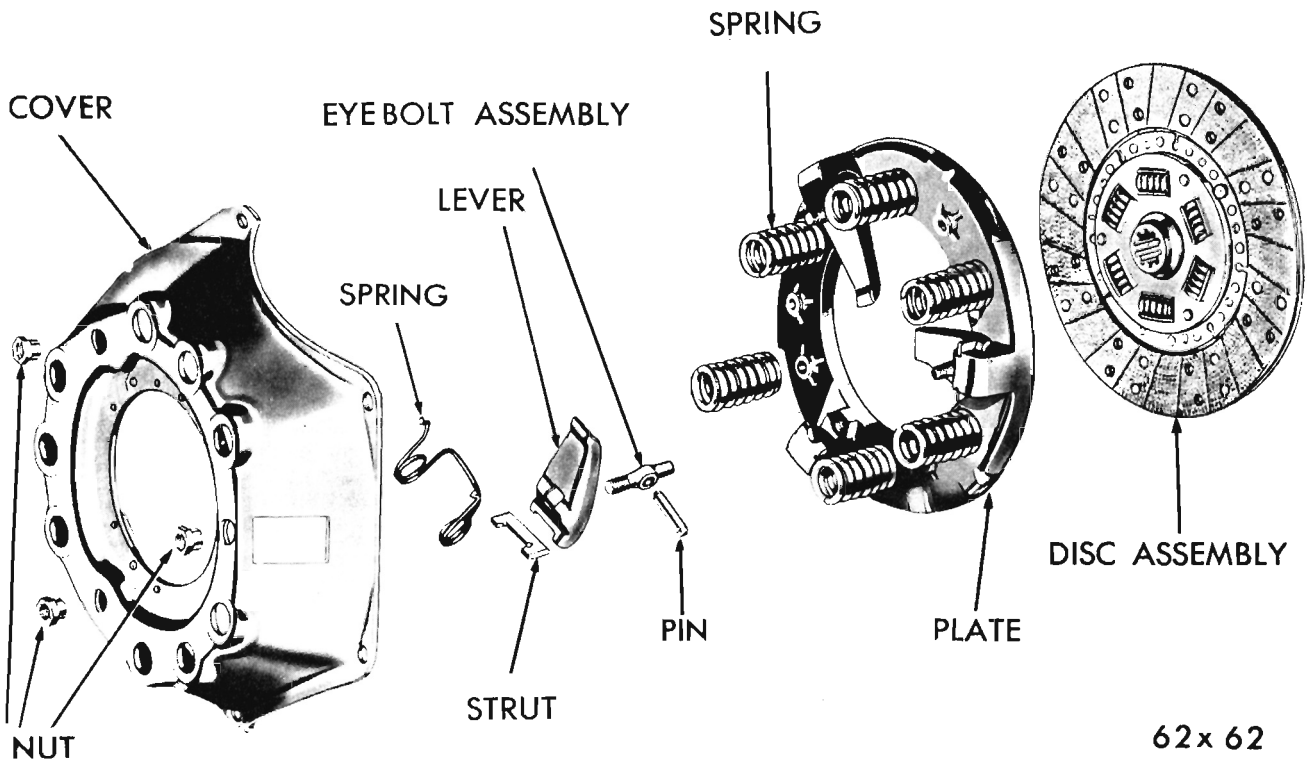


Fig. 5—Typical Clutch Assembly—Borg and Beck (Disassembled View)

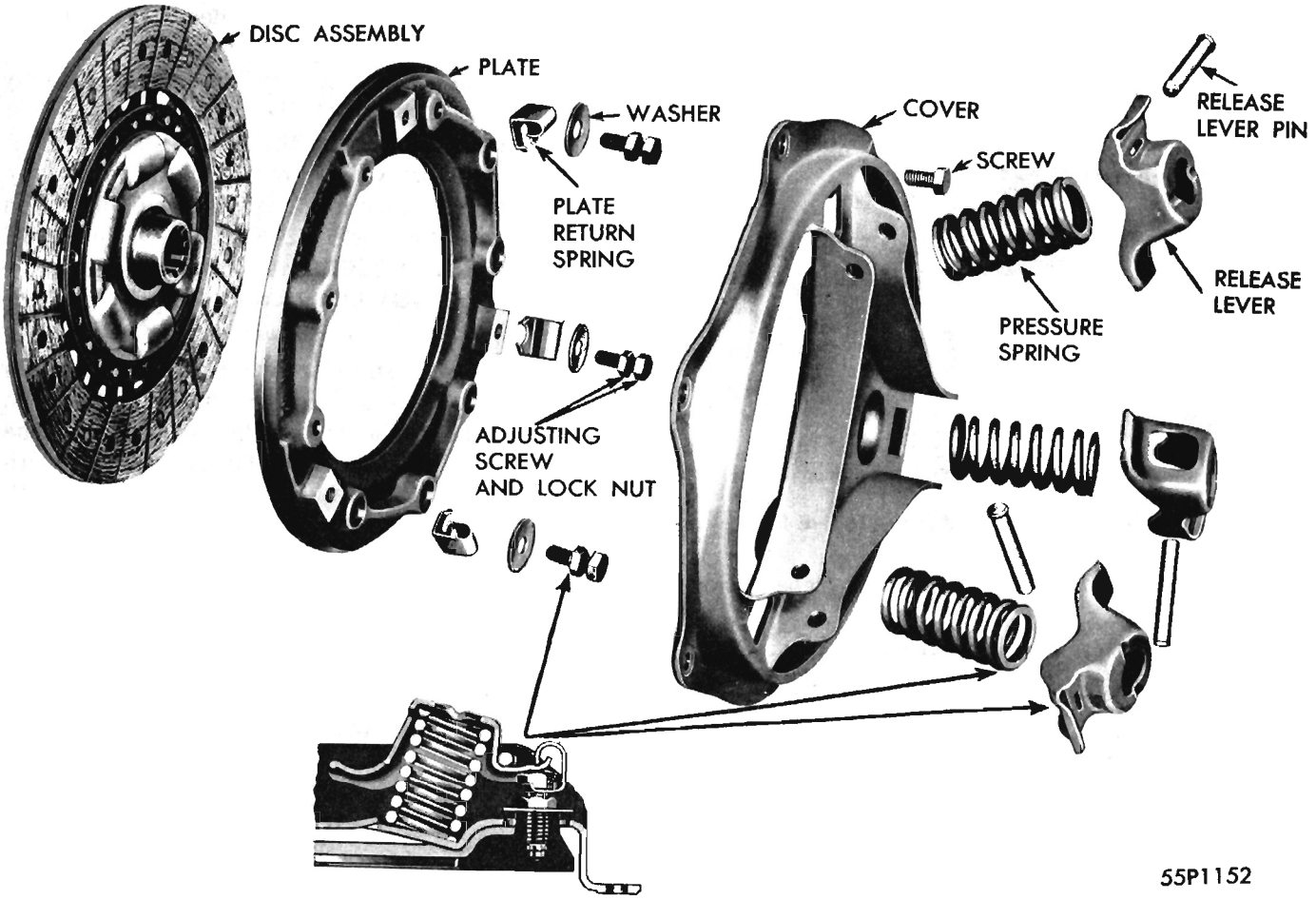


Fig. 6—Typical Clutch Assembly—Auburn (Disassembled View)

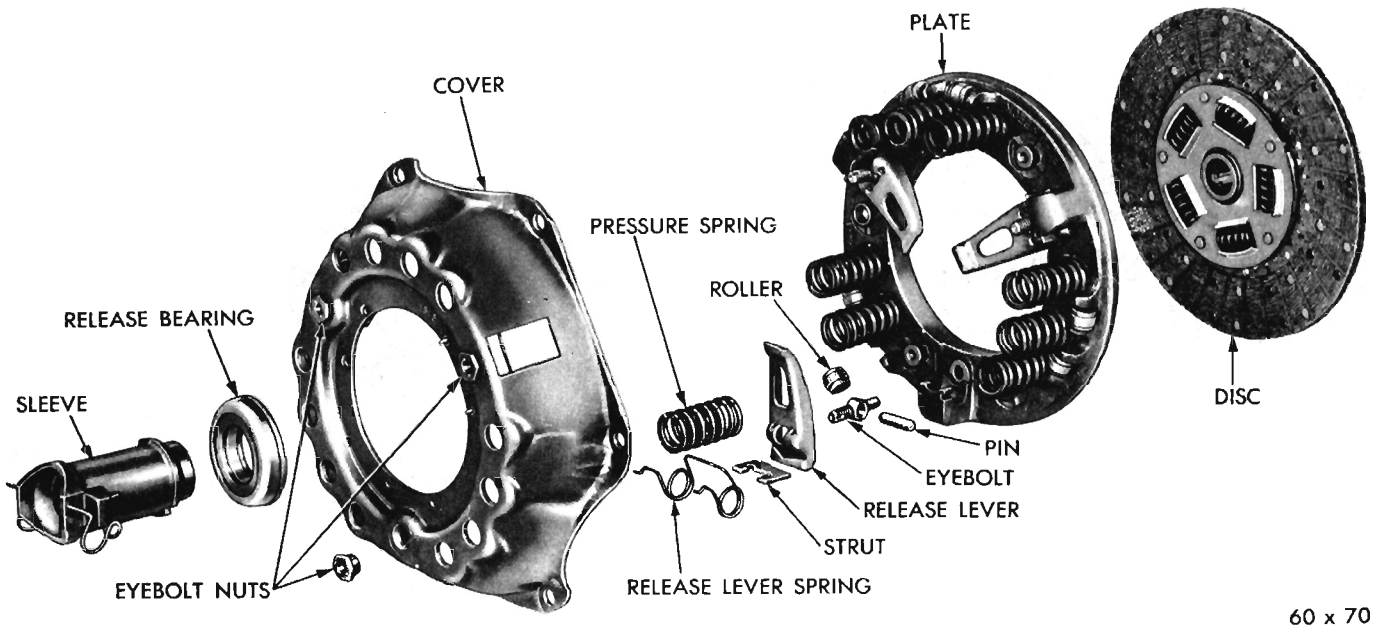


Fig. 7—Semi-Centrifugal Clutch (8-Cylinder)

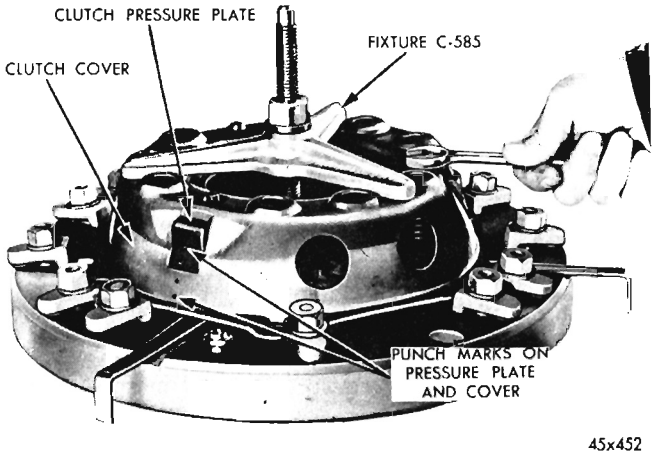


Fig. 8—Clutch Cover and Pressure Plate in Fixture (Tool C-585A)

(1) Mark the cover and pressure plate with a prick punch, as shown in Figure 8, so that they may be assembled in their original position to maintain balance.

(2) Mount the clutch assembly on compressing fixture Tool C-585A, as shown in Figure 8.

(3) Install the three-legged spider over the center screw, so that it rests directly on top of the clutch cover.

(4) Install the thrust washer and compression nut, then compress assembly by tightening the compression nut.

(5) With the assembly under pressure, remove the clutch release lever eyebolt nuts. Release the pressure by unscrewing the compression nut slowly in order to prevent the springs from flying out.

(6) The cover can now be lifted off exposing all parts for cleaning and inspection. **It is important that a notation is made of the location of parts, including the arrangement of the springs.** (Refer to Figure 10.)

(7) Remove rollers from slots in pressure plate.

(8) Grasp the lever and eyebolt between the thumb and fingers, as shown in Figure 9, so that inner end of lever and the upper end of eyebolt are close together (keep the eyebolt pin seated in its socket in the lever).

(9) Lift strut over ridge on end of lever and then remove lever and eyebolt from the pressure plate.

Inspection

Clean all parts thoroughly using a suitable solvent, then inspect carefully for excessive wear or distortion.

Pressure Plate

If the pressure plate shows signs of scoring, excessive wear, heat checking or, if warped more than .005 inch a new pressure plate should be installed.

Testing Pressure Springs

It is advisable to test pressure springs when the clutch is dismantled after considerable service or if there has been a great amount of slippage creating excessive heat, which may have caused the springs to lose their initial load. To test a spring, first determine the length at which the spring is to be tested. As an example, the compressed length of the spring to be tested is 1½ inch. Turn the table of Tool C-647 until surface is in line with the 1½ inch mark on the threaded stud and the zero mark to the front. Place spring over stud on table and lift compressing lever to set tone device. Pull on torque wrench tool C-3005

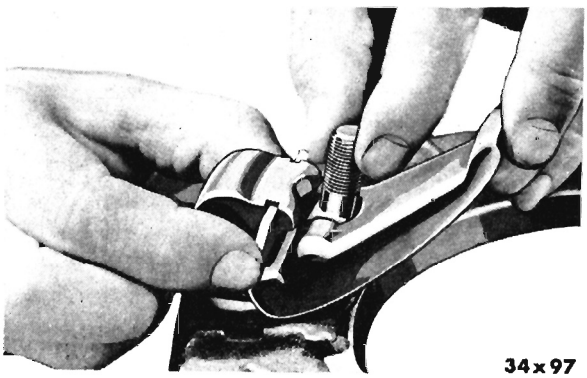


Fig. 9—Removing or Installing Clutch Release Lever

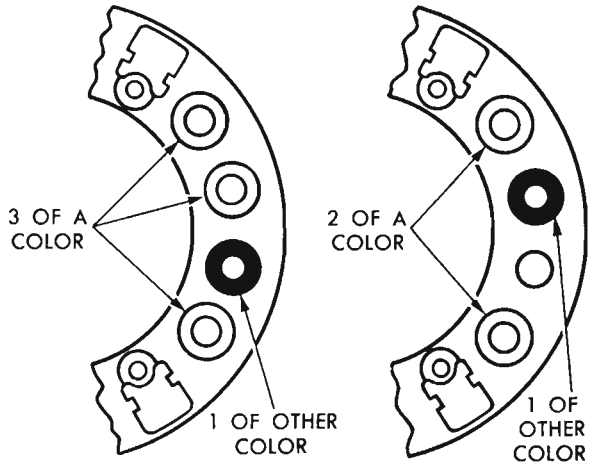


Fig. 10—Pressure Spring Replacement

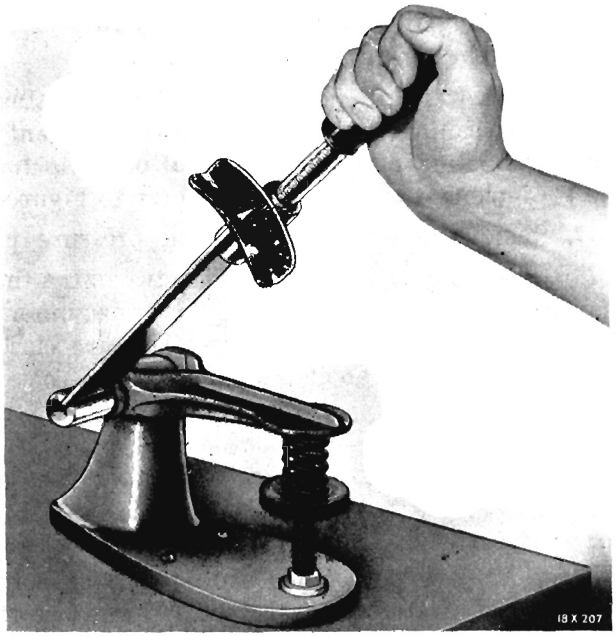


Fig. 11—Testing Clutch Pressure Springs

as shown in Figure 11, until ping is heard. Take reading on wrench at this instant. Multiply reading by two. This will give the spring load to the test length. Fractional measurements are indicated on table for finer adjustments. (Refer to Specifications and select model of clutch for spring pressure.) Discard springs that do not meet minimum requirement.

Cover Plate

Check the cover plate for distortion by laying plate on a smooth surface. If the cover shows signs of distortion, install a new cover.

Release Levers

Replace release levers that are badly worn on the tips (this is an indication of a sticking release bearing) or **an indication of insufficient clutch pedal free play or a damaged release bearing;** worn or damaged threads on eyebolts or adjusting nuts or where binding appears to be present which retards free back and forth movement. Check the struts for wear on the contact edges. Install new parts as required.

Assembling the Clutch

To reassemble the clutch, coat the driving lug sides, eyebolt tail and strut (Figure 12) with a thin coat of lubriplate, No. 220, then, assemble the release levers as follows:

Assemble the lever pin and eyebolt to the release lever. Holding the threaded end of eyebolt between the thumb and index finger, allow the end of lever to rest on second finger. Keep end of lever and eyebolt as close together as possible.

With the other hand, grasp strut between thumb and first finger, then insert in slot of pressure plate lug. Drop strut slightly until it touches the vertical milled surface of lug. Insert the lower end of eyebolt into hole in pressure plate, which will bring the short end of lever under the hood of lug and near the strut. Slide the strut upward in slot and lift over ridge and into groove on short end of lever.

Assemble the remaining release levers in the same manner. Continue to assemble, observing the following precautions:

(1) Place the pressure springs on the small bosses on the pressure plate and in the same order of sequence as whence removed. (See Figure 10.) **It is very important that the springs be arranged in like sequence in each group in order to retain original balance.**

(2) Install rollers in slots provided in pressure plate. (8 Cylinder Engine Clutches Only).

(3) Match up the prick punch marks made when disassembling, so that the cover and pressure plate will be assembled with the same relation to each other.

(4) The assembly may then be slowly compressed

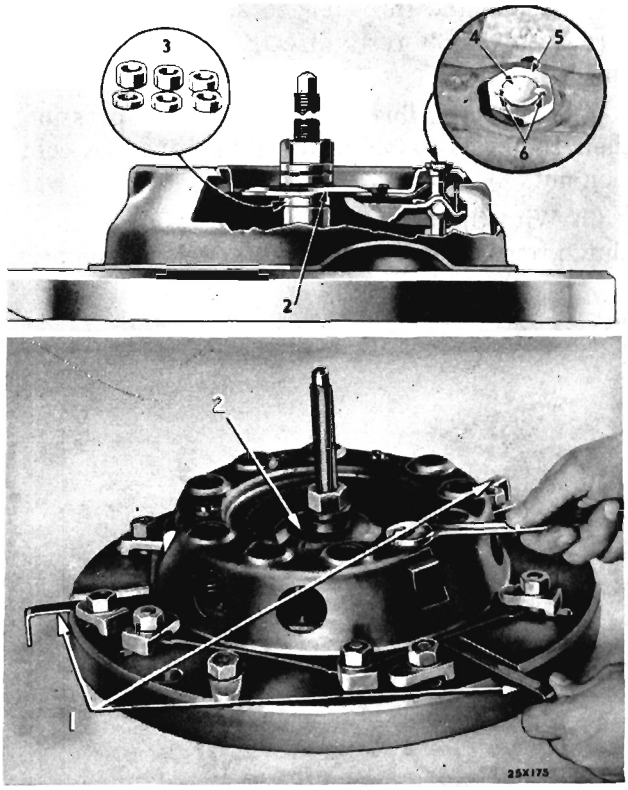


Fig. 12—Adjusting Clutch Release Levers

1 — Feeler Blades (Part of Tool C-585A)
2 — Compression Plate (Part of Tool C-585A)
3 — Spacers (Part of Tool C-585A)
4 — Clutch Release Lever Eye Bolt
5 — Clutch Release Lever Eye Bolt Nut
6 — Stake Here to Lock

(as outlined for disassembly), making sure that the eyebolts are guided through the holes in the cover.

(5) Screw the adjusting nuts on the protruding eyebolts, until the nuts are flush with the top of the eyebolts. Slowly release pressure by unscrewing the compression nut on the tool. Depress release levers several times to properly seat parts, using Tool C-585A.

Adjusting the Release Levers

Mount the clutch assembly on the fixture (Tool C-585A) with the release levers over the feeler gauges in the base of the fixture, then proceed as follows:

(1) Install the bolts that hold the cover to the fixture and tighten securely.

(2) Place the proper spacers on the center screw of the fixture. (Refer to specifications for model and spacer usage.)

(3) Install the compression plate on the center screw. Make sure it rests directly against the clutch release levers.

(4) Install the self-aligning washer, flatwasher and compression nut.

(5) Tighten the compression nut until the compression plate comes into contact with the spacers for setting lever height.

(6) Adjust the clutch release lever until the feeler gauges have the same slight **drag** or **feel** while being pushed in or pulled out. Tighten the nuts to decrease **drag** and loosen to increase **drag,** as shown in Figure 13.

(7) Recheck the release lever adjustment to make

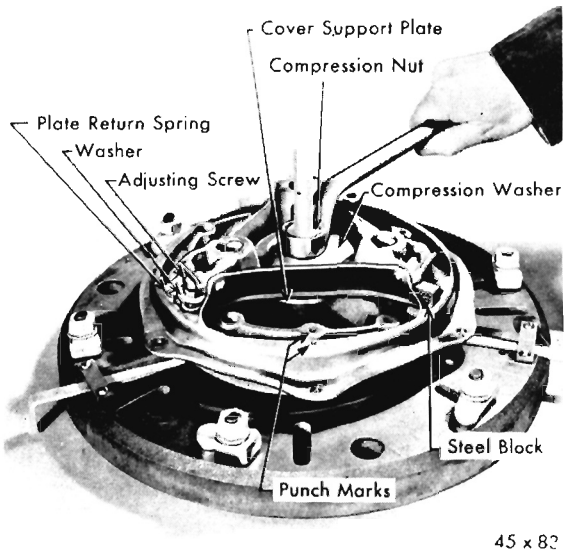


Fig. 13—Disassembling Auburn Clutch in Fixture (C-585A)

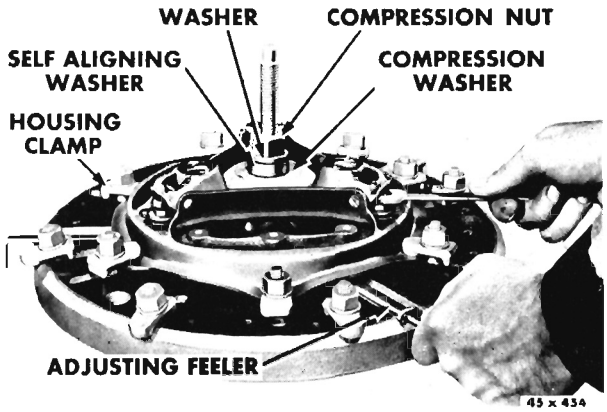


Fig. 14—Adjusting Clutch Release Levers (Auburn)

sure each one is adjusted properly. Stake the nuts to hold them in position.

(8) Check clearance between lugs and cover holes.

(9) Remove clutch from fixture and install in car, as described in Paragraph 1 of this Group.

3. SERVICING THE CLUTCH COVER (All Auburn)

To overhaul the clutch, refer to Figure 6, then proceed as follows:

(1) Mark the cover and pressure plate with a prick punch, as shown in Figure 14, so that they may be assembled in their original position to maintain balance.

(2) Place cover support plate (Tool C-585-33) over the center screw of fixture C-585A and install clutch cover assembly on fixture as shown in Figure 14.

(3) Install the cover support plate compression washer over the center screw, so that it rests directly on top of the clutch release levers.

(4) Install the compression nut and then compress the levers by tightening the compression nut.

(5) With the levers under pressure, remove the adjusting screw, washer and plate return spring. Place a ½ inch steel block (C-585-32), under the outer end of each lever. (Refer to Figure 14.)

(6) Back off the compression nut slowly until the release levers rise and contact the steel blocks. Remove the nut and compression washer and lift off cover.

(7) Remove the pressure springs by forcing each release lever downward by hand, lift out the steel block and allow the lever to return slowly. Lift out the pressure spring.

(8) Grind off one end of the lever pin, then drive the pin out of the lever and cover.

For cleaning and inspection, refer to Paragraph 2 of this Section. This is a standard procedure for all clutches.

Assembling the Clutch

To assemble the clutch, refer to Figure 6, then proceed as follows:

(1) Assemble the release levers to the cover. Install new pins and peen over.

(2) Install the pressure springs between the levers and cover. **Make sure the springs rest on the bosses of the cover and are seated in the embossed seats of the levers.**

(3) Press down each lever in turn by hand, and insert the steel blocks under the outer ends of levers.

(4) Install the cover support plate on the fixture and lower the cover over the pressure plate, with the punch marks aligned.

(5) Install the compression plate, self-aligning washer, thrust washer and compression nut.

(6) Tighten the compression nut and remove steel blocks. Install the washers and adjusting screws in the pressure plate.

(7) Unscrew the compression nut slowly, then install the pressure plate return springs. **Do not lubricate any parts of the cover or pressure plate with oil or grease. Use only lubriplate No. 220 applied in a very thin coat.**

Adjusting the Release Levers

(1) Install the clutch assembly on fixture, Tool C-585A, making certain that the housing clamps line up with holes.

(2) Slide proper spacer (or spacers—consult specifications) over the center screw of the fixture. Install the compression washer, the self-aligning washer, plain washer and the compression nut. Tighten the compression nut until compression plate comes into snug contact with spacer (or spacers).

(3) Adjust the clutch release levers, as shown in Figure 15, until each of the three feeler gauges have the same slight **drag** or **feel,** when being pushed in or pulled out. Tighten the release lever screws to decrease the **drag** or loosen them to increase the **drag.**

(4) Recheck the adjustment of each lever to make certain the adjustment is correct.

(5) Tighten the locknuts and remove the clutch assembly from the fixture. When removing the clutch assembly, loosen the housing clamps first, and then remove the compression nut. This procedure will avoid imposing unequal strain on the release levers.

(6) Install in car as described in Paragraph 1 of this Group.

4. SERVICING THE CLUTCH SHAFT PILOT BUSHING

To remove pilot bushing, screw the tapered pilot of Tool C-41 into the bushing, allowing pilot to cut its own threads until a solid grip is obtained. Insert puller screw and turn, forcing bushing out of crankshaft. **Tool C-3185 may be used if Tool C-41 is not available. Follow manufacturer's instructions for use.**

To replace pilot bushing, slide new bushing over the pilot of tool DD-286 and drive into place with a soft hammer. This causes bushing to tighten up on pilot. Install cup and puller nut and tighten, removing tool from bushing. This action burnishes the bushing to the exact size and leaves a smooth and lasting finish. **Tool C-3181 may be used if Tool DD-286 is not**

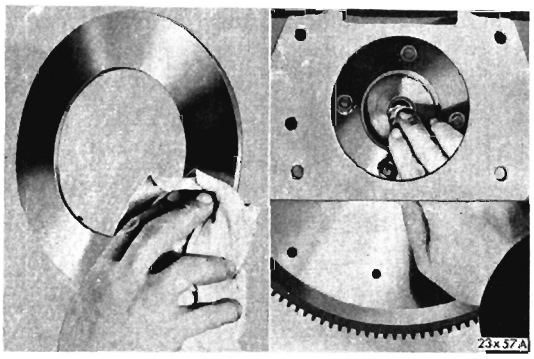


Fig. 15—Lubricating Pilot Bushing

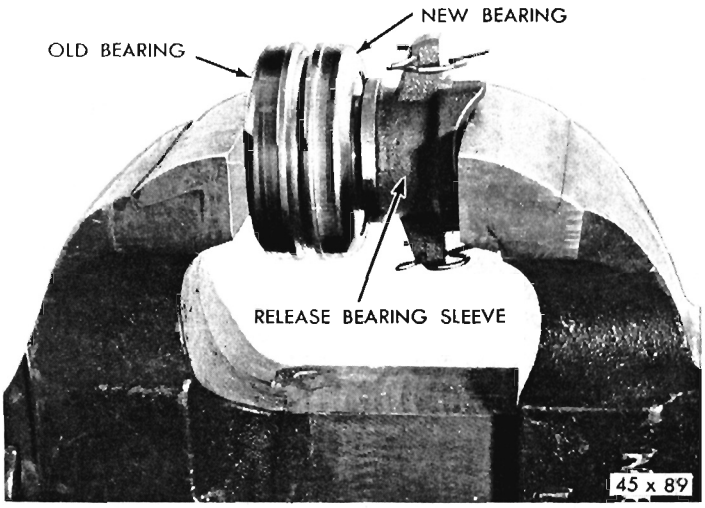


Fig. 16—Installing Clutch Release Bearing

available. Follow manufacturer's instructions for use.

Lubricate the bushing with about half a teaspoon of short fibre grease. Insert grease in radius at back of bushing (not on clutch shaft) as shown in Figure 16.

5. CLUTCH FORK

Removal

Should it become necessary to replace, remove or install the clutch fork, proceed as follows:

(1) Disconnect the clutch fork retracing spring (Refer to Figures 1 or 2).

(2) Disconnect clutch rod from clutch fork.

(3) Pry dust seal boot out of clutch housing and remove from clutch fork.

(4) Rotate retaining spring clips of the throw out bearing sleeve off of the ends of clutch fork.

(5) Grasp the outer end of clutch fork and pull clutch fork out and off of knife edge pivot. **The clutch fork has a riveted flat retaining spring that is engaged in a hole of the pivot bracket.**

(6) Remove clutch fork from clutch housing.

Installation

(1) Apply short fiber grease to the pivot edge and hole of pivot bracket. **The clutch release fork pivot is an 'L' shaped bracket bolted inside the clutch housing.**

(2) Lubricate contact areas of end of clutch fork.

(3) Install clutch fork in housing being careful to engage flat retaining spring in the hole of the pivot.

(4) Rotate retaining springs of bearing sleeve over ends of clutch fork. (Refer to Figures 1 or 2.)

(5) Install the dust seal boot over release fork and engage the groove of the boot into the clutch housing.

(6) Attach clutch rod and rehook retracting spring.

(7) Adjust clutch as described under General Information.

6. RELEASE BEARING (Clutch Removed)

Removal

(1) Support the release bearing in a vise or press and carefully press out the release bearing sleeve.

(2) Position new bearing on end of sleeve and using old bearing against the face of the new bearing, carefully press on bearing. Make certain bearing is seated on flange of release bearing sleeve.

Exercise care when installing a new clutch release bearing to avoid damaging the bearing race. Never drive the bearing on the sleeve with a hammer.

Then place the bearings and sleeve in a vise and

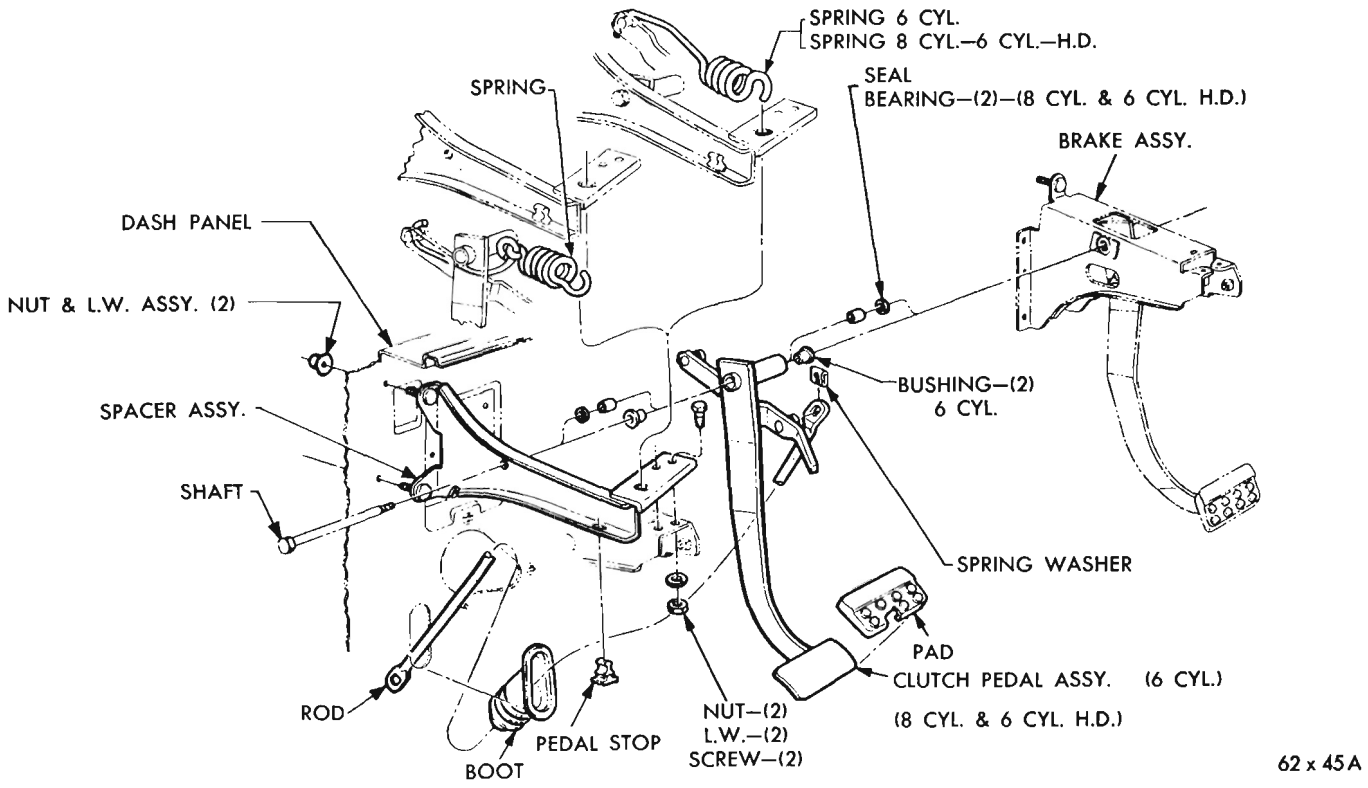


Fig. 17—Clutch Pedal Linkage (Disassembled View)

press the new bearing on the sleeve. See Figure 17. Turn the bearings as they are pressed together. The new bearing must be flush with the shoulder of the release bearing sleeve.

(3) Fill the cavity of bearing sleeve with short fiber grease prior to installation in car.

Installation

(1) Slide release bearing as far forward as it will go. Slide clutch fork into housing and engage with springs on throw-out bearing, allowing retaining spring to pass around pivot stud. **Before installing clutch fork, be sure the fork fingers are lubricated with short fiber grease and the pivot indent is lubricated with lubriplate No. 220.**

(2) Slide dust boot over outer end of clutch fork and down against clutch housing. Insert boot in housing until groove in boot fits around edge of housing opening.

(3) Engage rear end of clutch fork rod with fork align holes. Install clevis pin and flatwasher. Secure with spring retainer.

(4) Rehook the release fork pull back spring.

7. REMOVING OR INSTALLING THE TORQUE SHAFT PIVOT BUSHING

To replace the torque pivot bushing, refer to Figure 2 and proceed as follows:

(1) Unhook the clutch release fork return spring from the bracket and fork.

(2) Disconnect the clutch release fork and rod from the torque shaft.

(3) Remove the clutch release rod spring clip from the release rod and disconnect rod from torque shaft.

(4) Remove the torque tube bracket screws from the side shield and the pivot bolt/or bolts from the engine block and remove torque tube assembly.

(5) Remove spring retainer from end of torque tube and pull out the two pivot bushings. Repeat procedure at other end of tube.

(6) Clean all old grease from within the tube and reassemble. Lubricate and reassemble on car.

8. ADJUSTING THE CLUTCH PEDAL FREE MOVEMENT (Fig. 18)

(1) Inspect the linkage for damaged rubber clutch stop pad. Replace if necessary. The upper end of the clutch pedal pivots in the pedal mounting bracket. The nylon pedal bushing (6 cylinder) and needle bearings (8 cylinder) require no periodic lubrication.

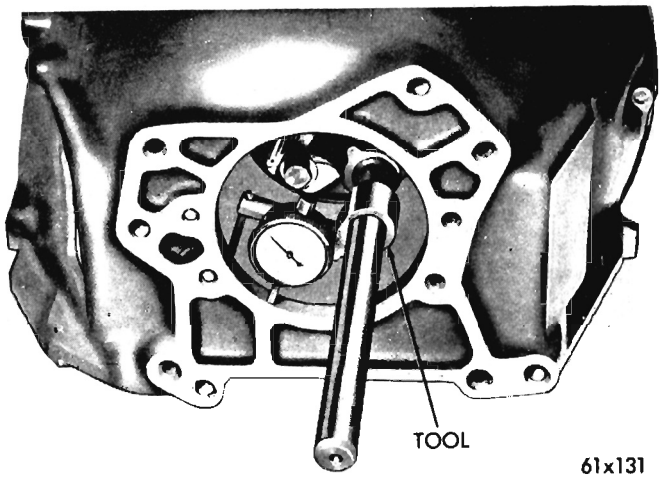


Fig. 18—Checking Clutch Housing Bore

(2) Set the release bearing free play by adjusting the self locking nut on the fork rod to provide 5/32 inch of free movement at the fork-to-push rod connecting pin. This will result in free play at the pedal of about 1 to 1¼ inch.

9. CLUTCH HOUSING ALIGNMENT

When performing adjustments or repairs that involve removing the clutch housing, it will be necessary to align the face of the housing parallel with that of the block when assembling.

Bore Runout

To correctly align the clutch housing, proceed as follows:

(1) Mount Tool C-870 with dial indicator C-435 on flywheel, as shown in Figure 19.

(2) With flywheel turning Tool C-771, crank engine while noting dial indicator needle deflection. Out-of-

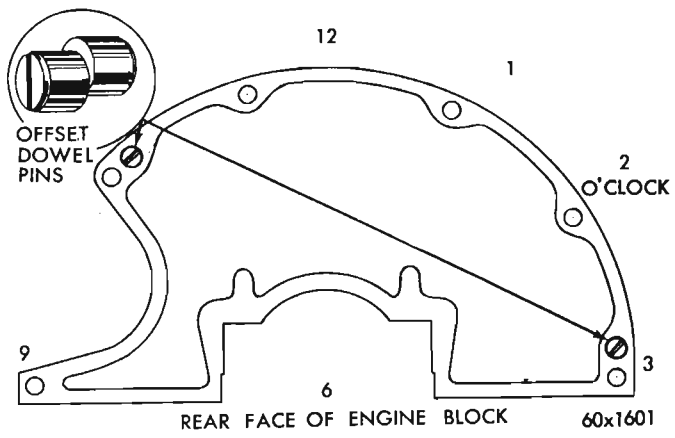


Fig. 19—Offset Dowel Diagram (6 Cyl.)

round of bore must not exceed .008 inch (maximum) total indicator reading.

If bore runout is in excess of .008 inch total indicator reading proceed with correction as follows:

To illustrate the recommended correction procedure, assume that the total indicator reading is .020 inch, in a direction which approximates 2 o'clock on engine block, (refer to Figures 20 or 21 depending on Model).

In this case, the housing is off crankshaft centerline .010 inch (one-half total indicator reading) which is .066 inch greater than the allowable limit of .004 (one-half total indicator reading).

In the case under consideration, use of the .007 inch offset dowels (pair) will bring the runout well within the allowable limits of .008 inch or .008 inch minus .007 inch (offset dowels) equals .001 inch runout. Dowels must be used in pairs **(same part number).**

(3) To install the dowel pins (pair), remove clutch housing (after disconnecting and removing starting motor). Remove dowel pins from engine block. Select eccentric dowels (pair) which are available with the following amount of offset: .007" (No. 1736347), .014" (No. 1736348), .021" (No. 1736353).

The amount of eccentricity of the dowel will produce a total indicator reading change of double the dowel eccentricity, therefore, a pair of dowels with the nearest to ½ of the total indicator runout of the bore. For runout (total indicator reading) of .012" through .020", use a .007" dowel (P/N1736347), .022" through .034", use .014" dowel (P/N 1736348), and .036" through .052", use .021" dowel (P/N 1736-353).

(4) Install both dowels with the slots parallel and aligned in the direction to correct the bore runout. (Slot indicates the direction of maximum dowel eccentricity.) Both dowels must be inserted into engine block, up to off-set shoulder.

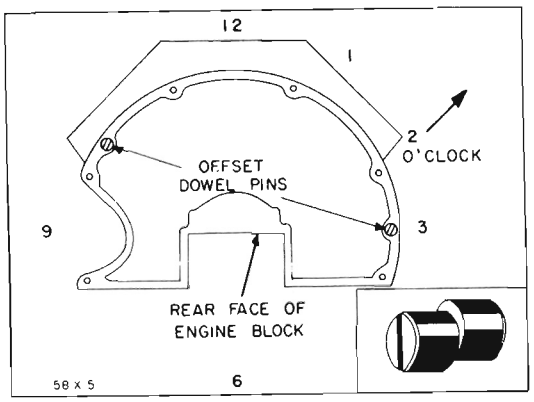


Fig. 20—Offset Dowel Diagram (8 Cyl.)

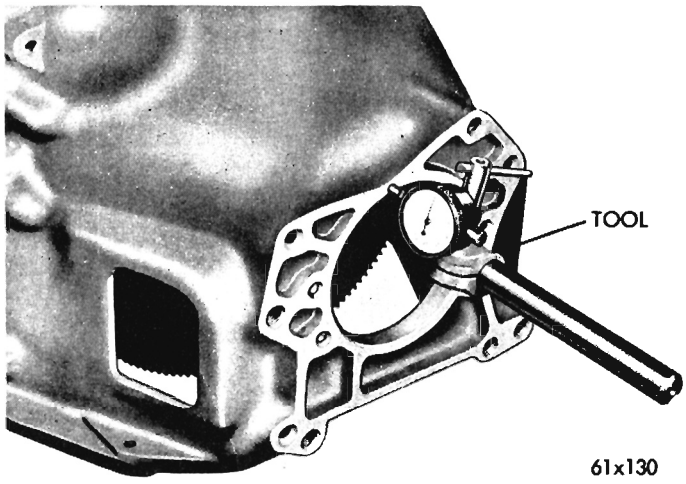


Fig. 21—Checking Clutch Housing Alignment

(5) Install and tighten clutch housing bolts to 50 foot-pounds (7/16"). Remount dial indicator and recheck bore runout. Small corrections can be made by removing clutch housing (if necessary) and turning dowels with a screw driver to shift the housing and bring bore within limits. (Refer to Figure 19.)

Face Runout

(1) Relocate dial indicator, as shown in Figure 21. Rotate flywheel, using Tool C-771. If the total indicator reading is greater than .006" note the amount of the total indicator reading and the location of the lowest indicator reading (i.e., the point where the indicator arm or follower is extended the furthest).

(2) To correct excessive runout, place proper thickness of shim stock between the clutch housing and engine block or between transmission and clutch housing. After re-checking face runout, tighten housing bolts to 50 foot-pounds. Install transmission.

10. STEAM CLEANING PRECAUTIONS

The clutch housing, being ventilated, steam vapor condenses and moisture settles on the internal moving parts of clutch mechanism. The facings of the disc will absorb moisture and under the force exerted by the pressure plate, will bond the facings to flywheel and/or, the pressure plate, if the car is allowed to stand for some time before use. If this condition occurs, it will necessitate complete replacement of disc, pressure plate, flywheel and/or, driving plate. **Immediately after the cleaning operation, start engine and "slip the clutch" in order to dry off the disc assembly, pressure plate, and/or flywheel.**

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
Clutch Chatter	(a) Worn or damaged disc assembly.	(a) Replace the disc assembly.
	(b) Grease or oil on disc facings.	(b) Replace the disc facing or disc assembly.
	(c) Improperly adjusted cover assembly.	(c) Remove and recondition.
Clutch Slipping	(a) Burned, worn, or oil soaked facings.	(a) Replace the facings or disc assembly.
	(b) Insufficient pedal free play.	(b) Adjust the release fork rod.
	(c) Weak or broken pressure springs.	(c) Recondition the cover assembly.
Difficult Gear Shifting	(a) Excessive pedal free play.	(a) Adjust the release fork rod.
	(b) Worn or damaged disc assembly.	(b) Replace the disc assembly.
	(c) Improperly adjusted cover assembly.	(c) Remove and recondition.
	(d) Clutch disc splines sticking.	(d) Remove the disc assembly and free up splines or replace the disc.
Clutch Noisy	(a) Dry clutch linkage.	(a) Lubricate where necessary.
	(b) Worn release bearing.	(b) Replace the release bearing.
	(c) Worn disc assembly.	(c) Replace the facings or disc assembly.
	(d) Worn release levers.	(d) Recondition the cover assembly.
	(e) Worn or dry pilot bushing.	(e) Lubricate or replace bushing.
	(f) Dry contact-pressure plate lugs in cover.	(f) Lubricate very lightly.

GROUP 7
COOLING SYSTEM

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SPECIFICATIONS

	Valiant VV-1		Plymouth VP-2, VP-1			
Engine Type	**170 Cu. In.**	**225 Cu. In.**	**225 Cu. In.**	**318 Cu. In.**	**361-383 Cu. In.**	**426 Cu. In.**
Capacity (Quarts)						
With Heater	12	13	13	21	17	17
Without Heater	11	12	12	20	16	16
Radiator Type	Tube & Spacer				Tube & Spacer Fin & Tube	
Transmission Oil Cooler						
Type	Concentric Tube					
Location	Radiator Bottom Tank					
Radiator Pressure Cap						
Type	Pressure Vent					
Pressure Setting	12-15 psi Std. 15-16 psi A/C					
Fan						
Diameter—No Blades	16"—4 Std. 17"—6 A/C	17"—4 Std. 18"—4 A/C		18"—4 Std. 18"—7 A/C		18"—7 Std.
Fan Spacer						
Thickness	.90" Std. .90" A/C	1.40" Std. 1.24" A/C	2.20" Std. 2.00" A/C		1.40" Std.	None
Fan Drive						
Silicone Fluid Filled—Thermal Control					A/C Only	Std.
Thermostat						
Type	Pellet					
Setting	177°-184°F					
Fan to Radiator Clearance	5/8"—1 1/4" Std. and A/C					
Radiator Fan Shroud	Full Ring	Full Ring	Box		Box	None

A/C—Air Conditioning

ACCESSORY BELT DRIVES

BELT TENSION SPECIFICATIONS

Belt Deflection Method

Deflection (Inches) To Be Applied at Midpoint of Belt Segment Under a 5 Lb. Load—See Figure 12

ACCESSORY	USED BELT				NEW BELT			
	170 Cu. In.	225 Cu. In.	318 Cu. In.	361-383 426 Cu. In.	170 Cu. In.	225 Cu. In.	318 Cu. In.	361-383 426 Cu. In.
Power Steering	1/8	1/8	1/8	3/16	1/16	1/16	1/16	1/8
Fan Belt Idler	—	—	—	1/8	—	—	—	1/16
Alternator								
Without A/C	1/4	1/4	1/4	1/4	5/32	1/8	1/8	1/8
With A/C	—	1/4	1/4	3/8	1/8	1/8	1/8	1/4

BELT TENSION SPECIFICATIONS 170-225 CU. IN. ENGINES

TORQUE METHOD

Torque (Ft-Lbs.) to be applied to components

ACCESSORY	NEW BELT	USED BELT*
Power Steering Bracket	80	45
Alternator	20	15
A/C Idler Bracket	35	25

BELT TENSION SPECIFICATIONS—318 CU. IN. ENGINE

TORQUE METHOD

Torque (Ft-Lbs.) to be applied to components

ACCESSORY	NEW BELT	USED BELT*
Power Steering Bracket	85	50
Alternator	50	30
A/C Idler Bracket	75	55

BELT TENSION SPECIFICATIONS—361, 383, 426 CU. IN. ENGINES

TORQUE METHOD

Torque (Ft-Lbs.) to be applied to components

ACCESSORY	NEW BELT	USED BELT*
Power Steering Bracket	90	55
Alternator		
With Air Conditioning	60	40
Without Air Conditioning	60	40
Fan Idler	50	35

*Any belt that has operated for a minimum of a half-hour is considered to be used.

SPECIAL TOOLS

C-412	Puller—Fan Hub
C-3250	Pliers—Hose Clamp
C-3468	Installer—Pump Bearing and Shaft
C-3476	Puller—Pump Impeller Insert
C-3499	Gauge—Pressure Testing
C-3514	Flushing Gun
C-3753	Remover—Pump Seal
C-3841	Belt Adjusting Tool

TORQUE REFERENCE

	Foot-Pounds
Water Pump Bolts	30
Fan Attaching Bolts	15-18
Thermostat Housing Bolts	30

COOLING SYSTEM

All engines are equipped with a 180° thermostat as standard equipment. With this thermostat, ethylene glycol base permanent type antifreeze must be used. If an alcohol type antifreeze is desired, a 160° thermostat must be installed.

When draining the cooling system, the cylinder block drain plugs should be removed and the radiator drain cock opened. Refill with either rust resistor and water or antifreeze and water depending on the season. The quantity of antifreeze to be added should be sufficient to protect for the lowest anticipated temperature.

Vehicles with factory equipped air conditioning must use at least 20% glycol (+15° protection) at all times, both winter and summer, to prevent heater core freezing.

SERVICE PROCEDURES

1. FAN

There are no repairs to be made on the fan. If the fan is bent or damaged it should be replaced.

Removal

Remove the upper half of the shroud (if so equipped). Loosen the fan belt and remove the four bolts attaching the fan to its pulley. On models so equipped, the fluid fan drive unit must be removed with the fan.

Installation

Use the correct spacer, if required, so that clearance between the fan blades and the radiator is from ⅝ inch to 1¼ inches. The fan should be installed so that the portion of each blade nearest the radiator is almost parallel to the radiator core. Installing the fan backwards (with the forward portion of the fan blade sharply angled away from the radiator core), will cause low air flow. Install the upper half of the shroud on vehicles so equipped. Tighten the fan belt as outlined in "Accessory Belt Drives".

2. FLUID FAN DRIVE

The fan drive unit is a silicone fluid filled coupling connecting the fan to the fan drive pulley. (Fig. 1.) The unit is designed to provide the following:

(1) Maintain satisfactory engine cooling in hot weather.

(2) Eliminate fan noise at all speeds in cold weather.

(3) Reduce fan noise in hot weather at high vehicle speed.

The speed of the drive is controlled by the thermal coil or spring mounted in front of the drive unit. The main features of the thermal drive is to run the fan slow in cold weather and faster in hot weather.

If a cooling malfunction is encountered and the fluid fan drive unit is suspected, install a unit known to be operating properly and test by operating the vehicle under the same conditions. Replace the drive unit assembly if the trouble was corrected with the test unit.

3. WATER PUMP

Removal from the Vehicle

(1) Drain the cooling system and remove the fan shroud (air conditioning equipped vehicles). Loosen the fan drive belt by loosening the alternator mounting bracket and swing the alternator in towards the water pump (on vehicles equipped with air conditioning, loosen the idler pulley).

(2) Remove the fan, spacer and pulley.

(3) Remove the water pump to housing retaining

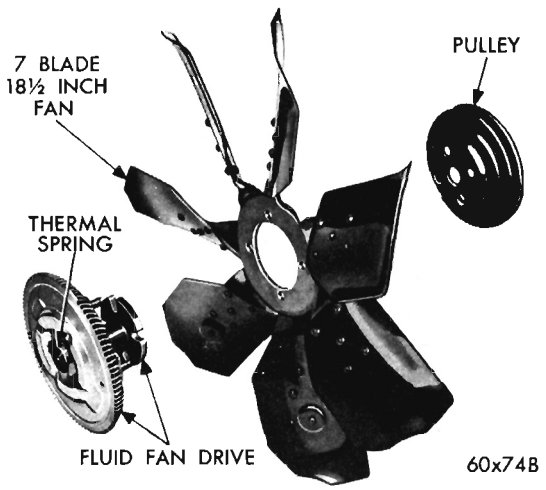


Fig. 1—Fluid Fan Drive

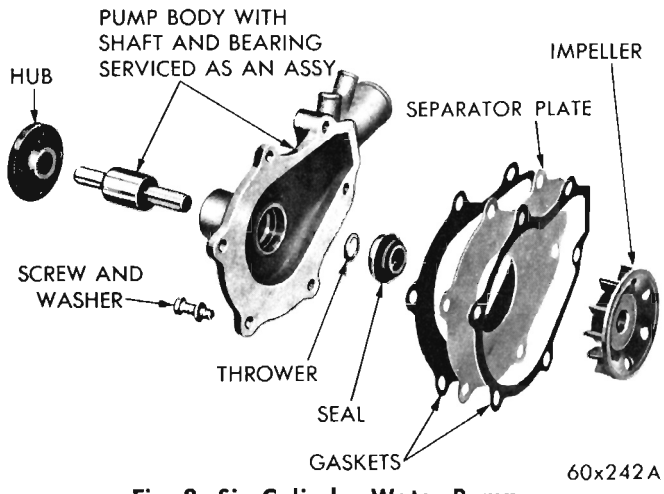


Fig. 2—Six Cylinder Water Pump

bolts and washers and remove the water pump from the vehicle. Discard the gasket.

Water Pump Disassembly (6-Cylinder) (Fig. 2)

(1) Break the plastic impeller and remove it from the metal insert. If the impeller is made from cast iron remove it with a suitable puller.

(2) Remove the separator plate and gasket.

(3) Split the sintered metal insert of the plastic impeller with a chisel and hammer.

(4) Remove the rubber portion of the shaft seal and the spring.

(5) Using puller Tool C-3753 (Fig. 3) remove the retainer portion of the seal.

(6) Remove the fan hub using puller Tool C-412.

(7) Support the pump body on the front face (fan hub end) and apply pressure to the rear end of the shaft to press the shaft and bearing assembly out through the front of the pump. If an attempt is made to remove the shaft in the opposite direction damage to the pump body may result.

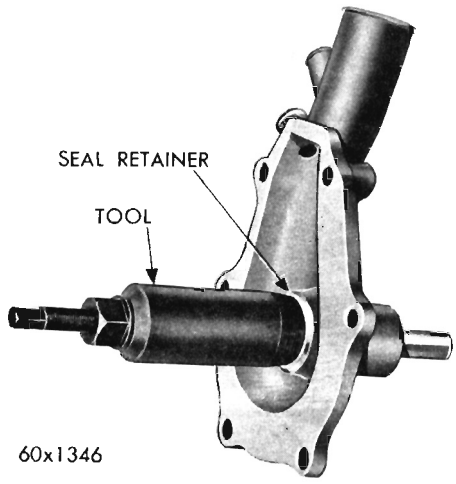


Fig. 3—Removing Seal Retainer

(8) Use a wire brush to remove all rust from the separator plate. Clean all parts with a suitable solvent and dry with compressed air. **Bearing assemblies removed from water pumps should not be reused,** as damage to the bearing will usually result during removal.

Water Pump Assembly (6-Cylinder)

Inspect seal surface of the impeller hub to be sure it is free of nicks, burrs, scratches and rust. If necessary remove these blemishes using crocus cloth on a flat plate.

(1) Apply a thin coat of Mopar Perfect Seal Sealing Compound, Part Number 1057794 to the seal pocket in the pump body.

(2) With the pump housing supported at the hub end, use a 1¼ inch (12 point) socket to apply pressure against the outer lip of the seal retainer and press the seal assembly into the body until the retainer lip is against the pump body.

(3) With the thrower ring in position on the long end of the pump shaft (approximately ⅛ inch from the bearing assembly) start the shaft and bearing assembly into the fan end of the pump body bore.

(4) Use a 1¼ inch (12 point) socket and support the pump body at the seal end, and with Tool C-3468, positioned against the outer bearing race only, press the shaft and bearing into the pump body so the end of the bearing is flush with the body hub end.

(5) While supporting the pump, on the impeller end of the shaft, press the fan hub onto the shaft (flat surface out) so the shaft extends $1\frac{3}{32}$ inch beyond the fan hub.

(6) Position new gaskets on each side of the separator plate and install the plate on the pump body.

(7) Clean the seal face and impeller hub seal surface.

(8) Support the pump on the fan hub end of the shaft and position the new impeller on the pump shaft (blade portion down). Using a tool that will press against the impeller insert only, press the impeller onto the shaft until it is flush with the end of the shaft.

Water Pump Disassembly (8-Cylinder) (318 Cubic Inch Engine) (Fig. 4)

(1) Break the plastic impeller and remove it from the metal insert. If the impeller is made of cast iron remove it with a suitable puller.

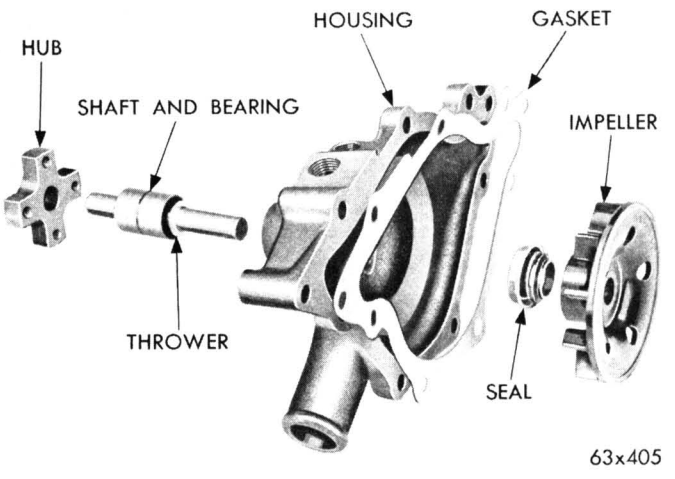


Fig. 4—318 Cubic Inch Engine Water Pump

(2) Split the sintered metal insert of the plastic impeller with a chisel and hammer.

(3) Remove the rubber portion of the shaft seal and the spring.

(4) Using puller Tool C-3753 remove the retainer portion of the seal.

(5) Remove the fan hub using puller Tool C-412 (Fig. 5).

(6) Support the pump body on the front face (fan hub end) and apply pressure to the rear end of the shaft to press the shaft and bearing assembly out through the front of the pump. If an attempt is made to remove the shaft in the opposite direction, damage to the pump body may result.

(7) Use a wire brush to remove all rust from the housing. Clean all parts with a suitable solvent and dry with compressed air. **Bearing assemblies removed from water pumps should not be reused,** as damage to the bearing will usually result during removal.

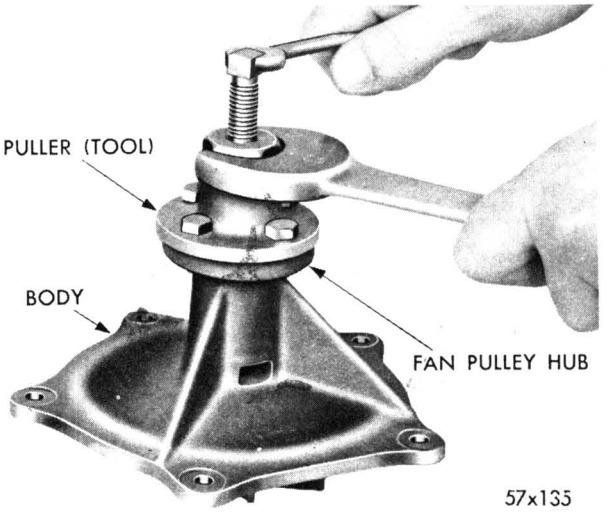


Fig. 5—Removing the Fan Hub

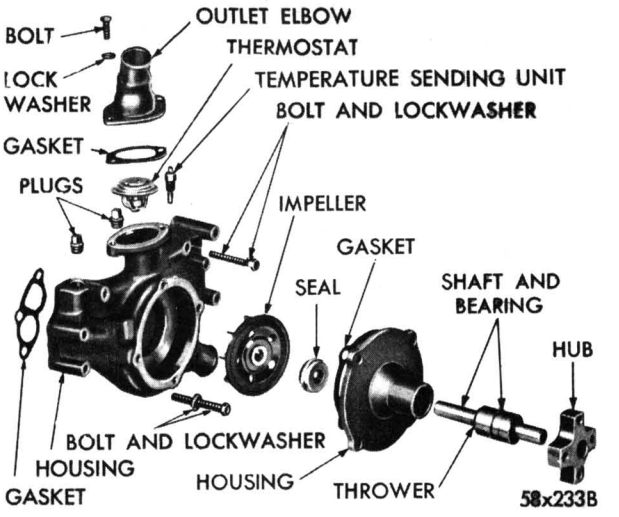


Fig. 6—361 Cubic Inch Engine Water Pump

Water Pump Disassembly (361-383-426 Cubic Inch Engines) (Fig. 6)

(1) Remove the fan hub from the shaft using puller, Tool C-412 as shown in Figure 5.

(2) Support the pump on the hub end and remove the plastic impeller by breaking it away from the metal insert (Fig. 7).

(3) Split the sintered metal insert of the plastic impeller with a chisel and hammer.

(4) Remove the rubber portion of the shaft seal and the spring.

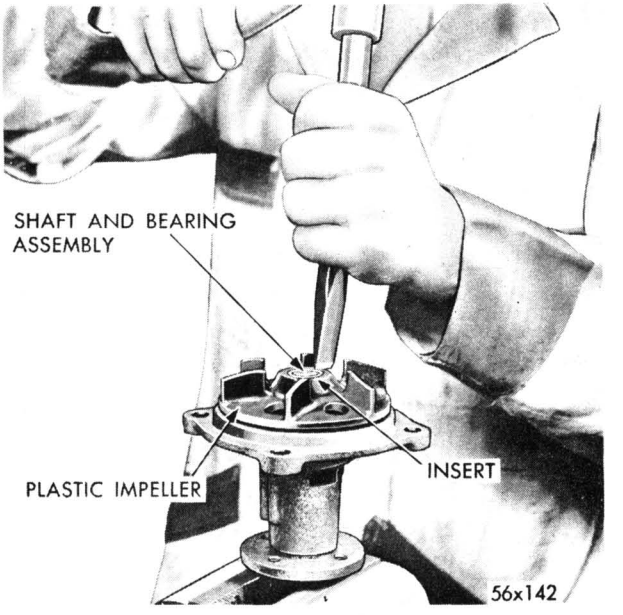


Fig. 7—Removing the Plastic Impeller

(5) Using Tool C-3753, remove the seal retainer from the housing.

(6) Support the body on the front face (fan hub end) and apply pressure to the rear end of the shaft to press out the shaft and bearing assembly through the **front** of the pump. **If an attempt is made to remove the shaft in the opposite direction, damage to the water pump body will result.**

Water Pump Assembly (8-Cylinder) (318 Cubic Inch Engine)

NOTE: Inspect the seal surface of the impeller hub to be sure it is free of nicks, burrs, scratches and rust. If necessary remove these blemishes using crocus cloth on a flat plate.

(1) Apply a thin coat of Mopar Perfect Seal Sealing Compound, Part Number 1057794 to the seal pocket in the pump body.

(2) With the pump housing supported at the hub end, use a 1¼ inch (12 point) socket to apply pressure against the outer lip of the seal retainer and press the seal assembly into the body until the retainer lip is against the pump body.

(3) With the thrower ring in position on the long end of the pump shaft (approximately ⅛ inch from the bearing assembly) start the shaft and bearing assembly into the fan hub end of the pump body bore.

(4) Use a 1¼ inch (12 point) socket and support the pump body at the seal end, and with Tool C-3468, positioned against the outer bearing race only, press the shaft and bearing into the pump body so the end bearing is flush with the housing.

(5) While supporting the pump on the impeller end of the shaft, press the fan hub onto the shaft so the shaft extends $1\frac{1}{32}$ inch through the fan hub.

(6) Support the pump on the fan hub end of the shaft and position the new impeller on the pump shaft (blade portion down). Using a tool that will press against the impeller insert only, press the impeller onto the shaft until it is flush with the end of the shaft.

Water Pump Assembly (361-383-426 Cubic Inch Engines)

Before assembling, clean all parts thoroughly in a suitable solvent and dry with compressed air.

CAUTION: Bearing assemblies removed from water pumps, for any reason should not be reused as damage to bearings will usually result during removal.

NOTE: Inspect the seal surface of the impeller hub to be sure it is free of nicks, burrs, scratches and rust. If necessary remove these blemishes using crocus cloth on a flat plate.

(1) Apply a thin coat of Mopar Perfect Seal Sealing Compound, Part Number 1057794 to the seal pocket in the pump body.

(2) With the pump housing supported at the hub end, use a 1¼ inch (12 point) socket to apply pressure against the outer lip of the seal retainer and press the seal assembly into the body until the retainer lip is against the pump body.

(3) With the thrower ring in position on the long end of the pump shaft (approximately ⅛ inch from the bearing assembly) start the shaft and bearing assembly into the fan hub end of the pump body bore.

(4) Use a 1¼ inch (12 point) socket and support the pump body at the seal end. With Tool C-3468 positioned against the outer bearing race, press the shaft and bearing into the pump body so the end of bearing is exactly flush with the end of the pump body.

(5) While supporting the pump on the impeller end of the shaft, press the fan hub onto the shaft (flat surface out) so the shaft extends $1\frac{1}{32}$ inch through the fan hub.

(6) Support the pump on the fan hub end of the shaft and position the new impeller on the pump shaft (blade portion up). Using a tool that will press against the impeller insert only, press the impeller onto the shaft until it is flush with the end of the shaft.

Installation

(1) Use a new gasket and install the water pump. Tighten the bolts to 30 foot-pounds.

(2) Install the pulley spacer, fan and shroud (when so equipped). Fill the cooling system and test for leaks. Test the belt tension as outlined in "Accessory Belt Drives".

4. RADIATOR

Removal

(1) Drain the cooling system.

(2) On vehicles with automatic transmission, disconnect the oil cooler lines at the radiator bottom tank.

(3) Remove the radiator hoses (using pliers, Tool C-3250), lower half of fan shroud, (if so equipped) and radiator attaching bolts.

(4) Raise the radiator straight up and out of the engine compartment.

Installation

(1) Slide the radiator down into position behind the radiator support and install the attaching bolts.

(2) Install the fan shroud (if so equipped), connect the hoses, and connect the transmission oil cooler lines (if so equipped).

(3) Fill the cooling system to 1¼ inches below the filler neck with water and rust resistor or water and antifreeze.

(4) Measure the transmission oil level (after warm-up) and add oil as required.

Cleaning

(1) Drain the cooling system and refill with clean SOFT water and add the contents of one can (No. 1 top-compartment) of MoPar Cooling System Cleaner.

(2) Operate the engine at a fast idle for ½ to ¾ hour.

(3) Drain the cooling system and refill with clean water.

(4) Pour the conditioner (No. 2 bottom-compartment) into the radiator and run engine for ten minutes.

(5) Flush the entire cooling system until water runs clean.

(6) Refill the radiator with clean SOFT water.

(7) Use MoPar Radiator Rust Inhibitor during the summer months.

5. TRANSMISSION OIL COOLER

Automatic transmission equipped vehicles use a transmission oil cooler in the radiator bottom tank. A leaking oil cooler may permit entrance of transmission oil into the cooling system and engine coolant into the transmission.

Testing Oil Coolers for Leaks

(1) Disconnect both oil lines at the radiator.

(2) Attach a pressure gauge to one radiator fitting and an air line equipped with a shut-off valve to the other fitting.

(3) Coat all fitting joints with oil.

(4) Apply air pressure (up to 100 psi). Oil bubbles will identify any fitting joint leaks which should be corrected before proceeding with the test.

(5) Close the valve and note pressure gauge reading. If pressure drops off, the oil cooler leaks.

Repairing the Oil Cooler

(1) Remove the radiator.

(2) Remove the radiator bottom tank.

(3) Melt the soft solder holding the cooler to the tank.

(4) Remove the stamped retainer nuts holding the cooler fittings to the bottom tank and remove the cooler.

(5) Install a new cooler or repair the old cooler with **silver solder** and reinstall as follows:

(6) Position the oil cooler in the bottom tank and install the stamped retainer nuts on the oil cooler fitting.

(7) Use soft solder to secure the cooler in the tank.

(8) Attach the bottom tank to the radiator using soft solder.

(9) Install the radiator as described in Paragraph 4.

(10) Fill the cooling system and test for leaks.

If the transmission operates properly after repairing the leak, drain the transmission and torque converter while hot, remove the transmission oil pan and inspect for sludge, rust, dirty or plugged inlet filter. If none of these conditions are found, reconditioning may not be necessary. Reassemble, using Transmission Fluid Type "A", Suffix "A".

6. PRESSURE FLUSHING THE COOLING SYSTEM

(1) Clean the system using the recommended Cooling System Cleaner according to the directions on the label.

(2) Drain the radiator and engine block and remove both radiator hoses.

(3) Remove the thermostat and reinstall the housing.

(4) Connect a flushing gun, Tool C-3514, to the engine thermostat housing, using a length of rubber hose.

(5) Install a drain hose on the water pump inlet.

(6) Connect a flushing gun to sources of water and air pressure.

(7) Fill the cylinder block with water by restricting the drain hose. Leave the water valve open.

(8) Open and close the air valve to agitate and force away any foreign material. Continue the operation until the water runs clear.

(9) For the final block flushing, fill the block with water and remove the drain plugs. Use air pressure until the water from the block drains runs clear.

(10) To reverse flush the radiator, disconnect the two hoses from the engine and attach them to the

radiator. Attach the flushing gun hose to the lower radiator tank and the drain hose to the top tank.

(11) Fill the radiator with water, leave the water valve open, and open and close the air valve. Continue the operation of the air valve until the water runs clear.

(12) For the final radiator flushing, attach a flushing gun to the top hose and repeat the flushing operation.

(13) Test the thermostat as described in paragraph 7. If satisfactory, install with the pellet towards the engine, using a new gasket.

(14) Install the hoses and fill the cooling system to 1¼ inches below the filler neck, using water and rust resistor or water and antifreeze, depending on the season.

(15) Operate the engine until the temperature gauge indicates normal operating temperature and continue an additional five minutes to release any air trapped in the system. Inspect the coolant level and if necessary, add additional water.

7. THERMOSTAT

The thermostat is actuated by a pellet containing a copper-impregnated wax (Fig. 8). As the temperature of the pellet increases, the wax expands and opens the valve. A 180° thermostat is standard equipment.

If the thermostat does not close completely when cold, the engine will warm up slowly or not at all, and heater performance will also be impaired. Poor heater performance may also be due to the valve opening at too low a temperature. Too high a valve opening temperature or a valve that will not open can cause overheating.

Removal

(1) Drain the cooling system down to the thermostat level or below.

(2) Remove the upper radiator hose from the thermostat housing using pliers Tool C-3250.

(3) Remove the thermostat housing bolts and remove the thermostat and housing.

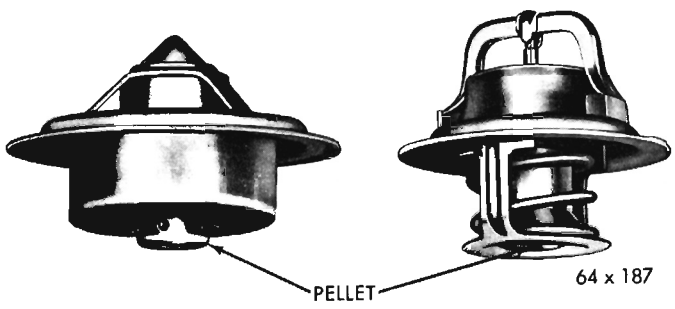


Fig. 8—Thermostats

Testing the Thermostat

(1) Visually inspect the thermostat to make sure the valve closes tightly. If the valve does not close completely due to dirt, sand or other foreign material, carefully clean the sealing edge making sure the sealing edge is not damaged. If the valve does not close tightly when clean, install a new thermostat.

(2) Immerse the thermostat in a container of warm water so that the pellet of the thermostat is completely covered. The pellet must not touch the bottom or sides of the container.

(3) Heat the water and stir it continuously (to insure uniform temperature) and test the water temperature with a thermometer at the point when a .003" feeler gauge can be inserted into the valve opening. The feeler gauge should pass freely into the valve opening at a water temperature of 175° to 185°F. If outside of this range, replace the thermostat.

(4) Continue heating the water to approximately 200°F. The thermostat valve should be fully open at this temperature. If it does not, replace the thermostat.

Installation

(1) Using a new gasket, position the thermostat so the pellet end is toward the engine and attach with bolts through the thermostat housing.

(2) If removed, reinstall or replace the upper hose using Tool C-3250.

(3) Fill the cooling system to 1¼ inches below the filler neck with water and rust resistor or water and antifreeze.

8. RADIATOR HOSES

The hoses are removed and installed using hose clamp pliers Tool C-3250.

A hardened, cracked, swollen or restricted hose should be replaced.

The reinforcement spring inside the lower hose is necessary to prevent collapsing of the hose due to suction at medium or high engine speeds. If this spring is weak or broken, it should be replaced.

9. RADIATOR PRESSURE CAP

A 14 psi pressure-vent type radiator cap (Fig. 9) is used as standard equipment (16 psi for air conditioned vehicles).

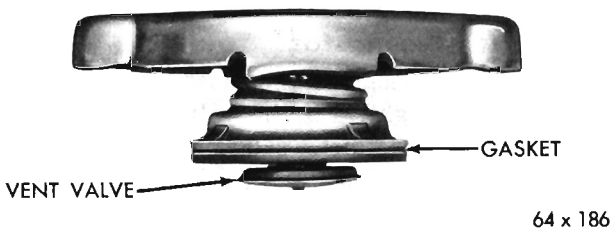


Fig. 9—Radiator Pressure Cap

When removing the pressure cap, turn the cap counter-clockwise to the stop permitting any pressure to be released through the overflow tube. This will prevent hot water from spraying out of the radiator filler opening after pausing at the stop, continue turning counter-clockwise until the cap is released.

The brass vent valve at the bottom of the cap should hang freely. If the rubber gasket has swollen and prevents the vent valve from hanging loosely, the cap should be replaced.

Pressure Testing the Radiator Cap (Fig. 10)

(1) Attach the neoprene seal and adapter to tester, Tool C-3499.

(2) Dip the pressure cap in water and install the cap on the tester adapter.

(3) Apply pressure to the cap. If the pressure cap fails to hold pressure within a range of 12 to 15 psi, replace with a new tested cap. (Air conditioned vehicles caps should test between 15 and 16 psi.)

10. PRESSURE TESTING THE COOLING SYSTEM

(1) For testing purposes only, fill the radiator to within ½ inch of the filler neck.

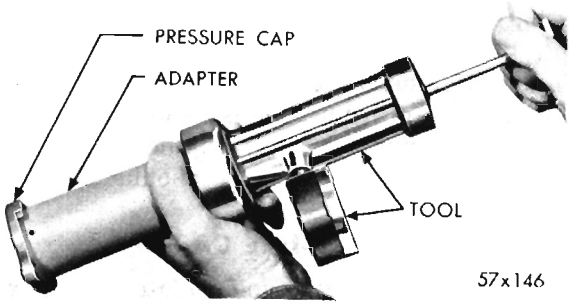


Fig. 10—Testing the Pressure Cap

(2) Wipe the filler neck sealing surface clean.

(3) Attach a tester Tool C-3499 to the filler neck and apply 15 psi pressure (Fig. 11).

(4) If the pressure gauge reading holds steady, the system is satisfactory. If the pressure drops, continue the test as follows:

(5) Test all points for external leaks. If no external leaks are found after the gauge dial showed a drop in pressure, continue the test.

(6) Remove the tester and run the engine until normal operating temperature is reached.

(7) Re-attach the tester, apply 7 psi pressure and increase engine speed to half throttle.

(8) If the needle on the dial fluctuates, it indicates a combustion leak, generally at the head gasket. On V-8 engines, detach spark plug leads from one bank and operate the engine on the opposite bank. If the needle continues to fluctuate, the bank in operation leaks. If the needle stops fluctuating, the bank not in operation leaks.

(9) If the needle on the dial did not fluctuate in step 7, sharply accelerate the engine several times. If an abnormal amount of water emits from the tail pipe, it indicates a head gasket leak, cracked block, or cracked head.

11. ENGINE WATER TEMPERATURE GAUGE

For Removal, Installation and Testing procedures of the water temperature sending and receiving units, refer to Group 8, Electrical system, "Gauges".

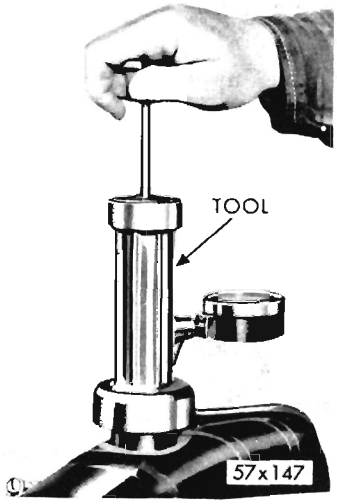


Fig. 11—Pressure Testing the Cooling System

ACCESSORY BELT DRIVES

12. PROPER BELT TENSION

The satisfactory performance of the belt driven accessories depends on the maintenance of the proper belt tension. If the specified tensions are not maintained, belt slippage may cause engine overheating, lack of power steering assist, loss in air conditioning capacity, reduced alternator charging rates, and greatly reduced belt life. To avoid any such adverse effects, the following service procedure should be followed:

(1) Retighten all belts to the specified **used belt** tension at the new vehicle preparation.

(2) Retighten all belts at the 2 month service inspection.

(3) Measure all belts by the deflection method at servicing and retighten if needed.

(4) The new belt tension specifications should be used on all belt replacements, and the above procedure followed thereafter.

There are two methods by which belt tensions can be properly established.

13. BELT DEFLECTION METHOD

The belts may be tensioned by measuring the

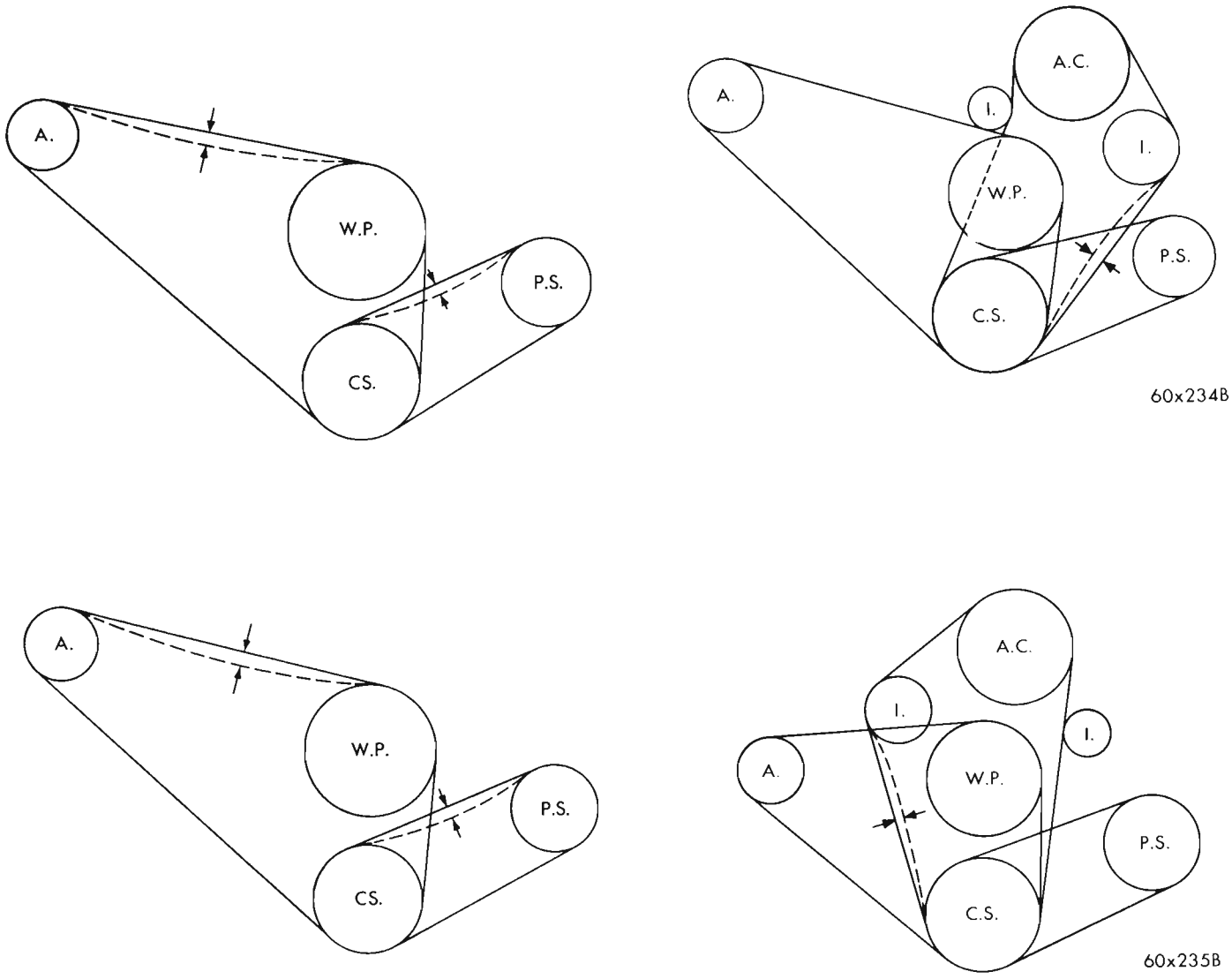


Fig. 12—Belt Deflection Locations

deflection of the belt at the mid-point between two pulleys under a five-pound push or pull. A small spring scale can be used to establish the five-pound load. See Figure 12 for correct locations at which to measure deflection.

This method should be used only when it is not possible to use the torque method, as it is a less accurate substitute. To tension the belts by the deflection method, loosen all the mounting bolts and use a bar to apply tension to the belts being careful not to damage the accessory. Tighten the mounting bolts and measure the deflection. (See Belt Tension Specifications.) It may be necessary to repeat this procedure several times to establish the correct tension.

Any belt that has operated for a minimum of a half-hour is considered to be "used".

14. TORQUE METHOD

The alternator and power steering pump belts may be tightened to the specified tension, by the use of a torque wrench. (Refer to Belt Tension Specifications.) The alternator belts are adjusted by using Tool C-3841 along with a torque wrench.

The power steering belts are adjusted by inserting the square shank of the torque wrench into the hole provided in the pump bracket.

To tighten the belts by the torque method, loosen all the mounting bolts, then apply the specified torque to the accessory, as shown in the Specifications. Tighten all the mounting bolts while the torque is applied to the accessory.

Other belts may also be tightened by this method if the adjusting bracket has a square hole. If it is not possible to use the torque wrench, because of clearance, use an extension.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
External Leakage	(a) Loose hose clamp.	(a) Replace the hose clamp.
	(b) Hose leaking.	(b) Replace the hose.
	(c) Leaking radiator.	(c) Repair or replace the radiator as necessary.
	(d) Worn or damaged water pump seal.	(d) Replace the water pump seal.
	(e) Loose core hole plug.	(e) Install new core hole plug.
	(f) Damaged gasket, or dry gasket, if engine has been stored.	(f) Replace gaskets as necessary.
	(g) Cylinder head bolts loose, or tightened unevenly.	(g) Replace the cylinder head gasket and torque head in correct sequence.
	(h) Leak at heater connection.	(h) Clean the heater connections and replace the hoses and clamps if necessary.
	(i) Leak at water temperature sending unit.	(i) Tighten the water temperature sending unit.
	(j) Leak at water pump attaching bolt.	(j) Tighten the water pump attaching bolts 30 foot-pounds torque.
	(k) Leak at exhaust manifold stud.	(k) Seal and re-drive the stud.
	(l) Cracked thermostat housing.	(l) Replace the thermostat housing.
	(m) Dented radiator inlet or outlet tube.	(m) Straighten the radiator inlet or outlet tube as necessary.
	(n) Leaking heater core.	(n) Repair or replace the heater core.
	(o) Cracked or porous water pump housing.	(o) Replace the water pump assembly.
	(p) Warped or cracked cylinder head.	(p) Replace the cylinder head.
	(q) Cracked cylinder block.	(q) Replace the cylinder block.
	(r) Sand holes or porous condition in block or head.	(r) Replace the cylinder block or cylinder head as necessary.
	(s) Faulty pressure cap.	(s) Replace pressure cap.
	(t) Loose or stripped oil cooler fittings.	(t) Tighten or replace as necessary.

SERVICE DIAGNOSIS—(Continued)

Condition	Possible Cause	Correction
Internal Leakage	(a) Faulty head gasket.	(a) Install a new head gasket.
	(b) Refer to causes (f), (g), (p), (q), (r) and (t) listed under External Leakage.	(b) Refer to corrections (f), (g), (p), (q), (r) and (t) listed under External Leakage.
	(c) Crack in head into valve compartment.	(c) Pressure test cooling system, replace the cylinder head.
	(d) Cracked valve port.	(d) Pressure test cooling system, replace the cylinder head.
	(e) Crack in block into push rod compartment.	(e) Pressure test cooling system, replace the cylinder block.
	(f) Cracked cylinder wall.	(f) Pressure test cooling system, replace the cylinder block.
	(g) Leaking oil cooler.	(g) Repair or replace the oil cooler.
Poor Circulation	(a) Low coolant level.	(a) Fill radiator to correct level.
	(b) Collapsed radiator hose. (A bottom hose with faulty spring may collapse only at medium or high engine speeds.)	(b) Replace the hose and spring.
	(c) Fan belt glazed, oil soaked, or loose.	(c) Tighten or replace the fan belt as necessary.
	(d) Air leak through bottom hose.	(d) Reposition hose clamps or replace the hose.
	(e) Faulty thermostat.	(e) Replace the thermostat.
	(f) Water pump impeller broken or loose on shaft.	(f) Replace the water pump impeller assembly.
	(g) Restricted radiator core water passages.	(g) Flush the radiator thoroughly.
	(h) Restricted engine water jacket.	(h) Flush the engine cooling system thoroughly.
Overheating or Apparent Overheating (refer to Causes listed under "Poor Circulation")	(a) Low coolant level.	(a) Fill radiator to proper level.
	(b) Blocked radiator air passages.	(b) Blow out the radiator air passages.
	(c) Incorrect ignition timing.	(c) Time the engine ignition system.
	(d) Low engine oil level.	(d) Add engine oil to the correct level.
	(e) Incorrect valve timing.	(e) Correct the engine valve timing.
	(f) Inaccurate temperature gauge.	(f) Replace the temperature gauge.
	(g) Restricted overflow tube.	(g) Remove restriction from the overflow tube.
	(h) Faulty radiator pressure cap or seat.	(h) Replace the radiator cap.
	(i) Frozen heat control valve.	(i) Free up the manifold heat control valve.
	(j) Dragging brakes.	(j) Adjust the brakes.
	(k) Excessive engine idling.	(k) Stop engine.
	(l) Frozen coolant.	(l) Thaw out cooling system, add antifreeze as required.
	(m) Faulty fan drive unit.	(m) Replace the fan drive unit.
	(n) Faulty temperature sending unit.	(n) Replace the sending unit.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
Overflow Loss	(a) Refer to causes listed under "Poor Circulation and Overheating".	(a) Refer to corrections under "Poor Circulation and Overheating".
	(b) Overfilling.	(b) Adjust coolant to the correct level.
	(c) Coolant foaming due to insufficient corrosion inhibitor.	(c) Flush the radiator and add MoPar antifreeze or rust inhibitor as required.
	(d) Air leak at bottom radiator hose.	(d) Reposition hose clamps or replace the hose.
	(e) Blown head gasket.	(e) Replace the head gasket.
Corrosion	(a) Use of water containing large concentration of lime and minerals.	(a) Use only clean soft water.
	(b) Low coolant level.	(b) Fill the cooling system to the correct level.
	(c) Insufficient corrosion inhibitor.	(c) Use MoPar antifreeze or rust inhibitor as required.
	(d) Use of antifreeze for extended length of time.	(d) Drain cooling system and replace with new antifreeze.
	(e) Failure to use corrosion inhibitor in summer.	(e) Flush radiator and refill with clean soft water and rust inhibitor.
	(f) Air leak at bottom radiator hose.	(f) Reposition hose clamps or replace the hose.
Temperature Too Low—Slow Engine Warm Up	(a) Faulty thermostat.	(a) Replace the thermostat.
	(b) Inaccurate temperature gauge.	(b) Replace the temperature gauge.
	(c) Faulty temperature sending unit.	(c) Replace the sending unit.
Water Pump Noisy	(a) Seal noisy.	(a) Add 202 MoPar Water Pump Lube.
	(b) Bearing corroded.	(b) Replace bearing seal and impeller.

ACCESSORY DRIVE BELTS

Insufficient Accessory Output Due to Belt Slippage	(a) Belt too loose.	(a) Adjust belt tension.
	(b) Belt excessively glazed or worn.	(b) Replace and tighten as specified.
Belt Squeal When Accelerating Engine	(a) Belts too loose.	(a) Adjust belt tensions.
	(b) Belts glazed.	(b) Replace belts.
Belt Squeak at Idle	(a) Belt too loose.	(a) Adjust belt tension.
	(b) Dirt and paint imbedded in belt.	(b) Replace belt.
	(c) Non-uniform belt.	(c) Replace belt.
	(d) Misaligned pulleys.	(d) Align accessories (file brackets or use spacers as required).
	(e) Non-uniform groove or eccentric pulley.	(e) Replace pulley.
Belt Rolled Over in Groove	(a) Broken cord in belt.	(a) Replace belt.
	(b) Belts not matched (A/C).	(b) Install matched belts.
Belt Jumps Off	(a) Belt too loose.	(a) Adjust belt tension.
	(b) Belts not matched (A/C).	(b) Install matched belts.
	(c) Misaligned pulleys.	(c) Align accessories.

GROUP 8

ELECTRICAL

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SPECIFICATIONS

BATTERY

Model Usage	VV-1 Standard With 170 Cu. In. Engines	VV-1 Standard With 225 Cu. In. Engines	VP1-VP2 Standard With 225 Cu. In. Engines	VP-2 Standard With 361 Cu. In. Engines	VP-2 Standard With 383 Cu. In. Engines
Capacity (Ampere Hours)	38	48	48	59	70
Voltage	12	12	12	12	12
Number of Plates Per Cell	7	9	9	11	13
Ground Terminal	Negative	Negative	Negative	Negative	Negative
Model Identification Number	M9HS-38	MB-24-48	MB-24-48	MB-24-59	MB-27-70

STARTING MOTOR

	*VP-1	All Plymouth Models with 8 Cylinder Engines.	(VV1, with 170 Cu. In.)
Starting Motor Type	Direct Drive	(Gear Reduction)	(Gear Reduction)
Identification Number	2095753	2095150	2098500
Make	Chrysler Built	Chrysler Built	Chrysler Built
Voltage	12	12	12
No. of Fields	4 (4-Series)	4 (3 Series, 1 Shunt)	4 (4 Series)
No. of Poles	4	4	4
Brushes	4	4	4
Spring Tension	32 to 48 Ounces	32 to 48 Ounces	32 to 48 Ounces
Drive	Overrunning Clutch	Overrunning Clutch	Overrunning Clutch
End Play	.005" Minimum	.010"-.035"	.010"-.035"
Free-Running Test			
Voltage	11	11	11
Amperage	78	90	90
Speed RPM	3800	1925 to 2400	2950
Lock-Resistance Test			
Voltage	4	4	4
Amperage Draw	350	400 to 450	340 to 420
Solenoid Switch			
Pull-In Coil	20.0 to 22.2 Amps. @ 6.0 Volts	14.4 to 16.0 Amps. @ 6.0 Volts	14.4 to 16.0 Amps. @ 6.0 Volts
Hold-In Coil	11.2 to 12.4 Amps. @ 6.0 Volts	11.5 to 12.6 Amps. @ 6.0 Volts	11.5 to 12.6 Amps. @ 6.0 Volts

*Taxi and Police Use.

SPECIFICATIONS

ALTERNATOR AND VOLTAGE REGULATOR

ALTERNATOR

ALTERNATORS	
Rotation	Clockwise at Drive End
Voltage	12 Volt System
Current Output	Design Controlled
Voltage Output	Limited by Voltage Regulator
Brushes (Field)	2
Condenser Capacity	.50 Microfarad plus or minus 20%
Field Current Draw—	
Rotating Rotor by Hand @ 12 Volts	2.38 to 2.75 Maximum amperes
Current Output—	
Valiant	26 plus or minus 3 amperes
Standard (Except Valiant)	34.5 plus or minus 3 amperes
Special Equip., Heavy Duty and/or Air Conditioning (Both Single and Double Pulleys)	39 plus or minus 3 amperes

NOTE: Plus or minus three ampere tolerance is provided to allow for temperature variation. Current output is measured at1250 engine RPM. and 15 volts. Voltage is controlled by variable load across the battery such as a carbon pile.

ALTERNATOR VOLTAGE REGULATOR

Alternator Voltage	
Regulator Identification Number	2098300
Volts	12
Ground Polarity	Negative
Point Gap	.014 inch plus or minus .002 inch
Air Gap	.048 to .052 inch nominal setting

Measure gap with gauge back of stop. Contacts close with .052 inch gauge installed. Contacts open with .048 inch gauge installed.

Temperature in Degrees	47°F.	70°F.	93°F.	117°F.	140°F.	163°F.
Minimum Setting	13.8 to	13.7 to	13.6 to	13.5 to	13.4 to	13.3 to
Maximum Setting	14.4	14.3	14.2	14.1	14.0	13.9

IGNITION SYSTEM

Vehicle Model	VV1, VP1 (Taxi) (Manual Trans.)		VV1 (with Automatic Trans.)		VP1, Std. Equipment VV, Special Equipment		
Engine Displacement	170 cu. in.		170 cu. in.		225 cu. in.		
Distributor	Chrysler Built		Chrysler Built		Chrysler Built		
Identification No.	2444255		2444256		2444254		
Advance—Automatic (Distributor Degrees at Distributor RPM)	0° @ 375 to 525		0° @ 325 to 475		0° @ 390 to 560		
	0 to 2.5° @ 525		0 to 7° @ 475		0 to 2° @ 560		
	8 to 10° @ 1010		6 to 8° @ 600		6 to 8° @ 1080		
	12.5 to 14.5° @ 2200		12.5 to 14.5° @ 2200		10.5 to 12.5° @ 2500		
Advance—Vacuum (Distributor Degrees at Inches of Mercury)	0° @ 5" to 7.1"		0° @ 5" to 7.1"		0° @ 4.9" to 7.1"		
	4 to 7° @ 9.2"		3 to 6° @ 8.5"		3 to 5° @ 10.5"		
	8.5 to 11.5° @ 12"		6 to 8.5° @ 10"		5.25 to 7.5° @ 13"		
Breaker Point Gap	.017" to .023"		.017" to .023"		.017" to .023"		
Dwell Angle	40 to 45°		40 to 45°		40 to 45°		
Breaker Arm Spring Tension	17 to 20 oz.		17 to 20 oz.		17 to 20 oz.		
Condenser Capacity	.25 to .285 mfd.		.25 to .285 mfd.		.25 to .285 mfd.		
Shaft Side Play (New or Rebuilt)	.000" to .003"*		.000" to .003"*		.000" to .003"*		
Shaft End Play (After Assembly)	.003" to .017"		.003" to .017"		.003" to .017"		
Rotation	Clockwise		Clockwise		Clockwise		
Spark Plug Type	N-14Y Champion		N-14Y Champion		N-14Y Champion		
Size	14 MM—¾ Reach		14 MM—¾ Reach		14 MM—¾ Reach		
Gap	.035"		.035"		.035"		
Firing Order	1-5-3-6-2-4		1-5-3-6-2-4		1-5-3-6-2-4		
Ignition Timing	2½° BTC		2½° BTC		2½° BTC		
Coil	Chrysler	Prestolite	Chrysler	Essex	Chrysler	Prestolite	Chrysler	Essex
Identification No.	2444242	200759	2444241	67-160-4	2444242	200759	2444241	67-160-4
Primary Resistance @ 70-80° F.	1.65-1.79 ohms		1.41-1.55 ohms		1.65-1.79 ohms		1.41-1.55 ohms	
Secondary Resistance @ 70-80° F.	9400-11700 ohms		9400-11700 ohms		9400-11700 ohms		9200-10600 ohms	
Ballast Resistor	2095501				2095501			
Resistance @ 70-80° F.	0.5-0.6 ohms				0.5-0.6 ohms			
Current Draw (Coil and Ballast Resistor in Circuit)								
Engine Stopped	3.0 Amperes				3.0 Amperes			
Engine Idling	1.9 Amperes				1.9 Amperes			

*Service wear tolerance should not exceed .006 inch.

SPECIFICATIONS—(Continued)

IGNITION SYSTEM

Vehicle Model	VP-2 with 2 bbl. Carb. & Automatic Trans.	VP-2 with 2 bbl. Carb. & Manual Trans.
Engine Displacement	318 Cubic Inch	318 Cubic Inch
Distributor	Chrysler Built	Chrysler Built
Identification No.	2444259	2444258
Advance—Automatic (Distributor Degrees at Distributor RPM)	0° @ 330 to 570 0 to 2° @ 570 2 to 4° @ 800 8 to 10° @ 2300	0° @ 320 to 480 0 to 2° @ 480 4.5 to 6.5° @ 850 10.5 to 12.5° @ 2300
Advance—Vacuum (Distributor Degrees at Inches of Mercury)	0° @ 8 to 10" 5 to 8° @ 13" 9 to 12° @ 16"	0° @ 8 to 10" 5 to 8° @ 13" 9 to 12° @ 16"
Breaker Point Gap	.014" to .019"	.014" to .019"
Dwell Angle	28° to 33°	28° to 33°
Breaker Arm Spring Tension	17 to 20 oz.	17 to 20 oz.
Condenser Capacity	.25 to .285 mfd.	.25 to .285 mfd.
Shaft Side Play (New or Rebuilt)	.000 to .003"*	.000 to .003"*
Shaft End Play (After Assembly)	.003 to .017"	.003 to .017"
Rotation	Clockwise	Clockwise
Spark Plug Type	J-12Y Champion	J-12Y Champion
Size	14 MM—⅜ Reach	14 MM—⅜ Reach
Gap	.035"	.035"
Firing Order	1-8-4-3-6-5-7-2	1-8-4-3-6-5-7-2
Ignition Timing	10° BTC	10° BTC
Coil	Chrysler / Prestolite	Chrysler / Essex
Identification No.	2444242 / 200759	2444241 / 67-160-4
Primary Resistance @ 70-80° F.	1.65 to 1.79 ohms	1.41 to 1.55 ohms
Secondary Resistance @ 70-80° F.	9400 to 11700 ohms	9200 to 10600 ohms
Ballast Resistor	2095501	
Resistance	0.5 to 0.6 ohms	
Current Draw (Coil and Ballast Resistor in the Circuit)		
Engine Stopped	3.0 amperes	
Engine Idling	1.9 amperes	

*Service wear tolerance should not exceed .006 inch.

IGNITION SYSTEM

Vehicle Model	VP-2 Power Pack with 2 bbl. Carb.		VP-2 with 4 bbl. Carb. Hi-Perf. Max. Police Pkg.		VP-2 with 4 bbl. Carb.			
Engine Displacement	361 cu. in. 383 cu. in.		383 cu. in.		426 cu. in.			
Distributor	Chrysler Built		Prestolite Built		Prestolite Built			
Advance—Automatic (Distributor Degrees at Distributor RPM)	2444261		2444358 IBS—4006J		2444247 IBS—4011E			
	0° @ 250 to 450		0° @ 325 to 475		0° @ 260 to 540			
	0 to 2° @ 450		0 to 4° @ 475		0 to 2° @ 540			
	2.5 to 4.5° @ 700		4.5 to 6.5" @ 640		3.5 to 5.5° @ 1050			
	10.5 to 12.5° @ 2150		9 to 11° @ 2400		7 to 9° @ 2400			
Advance—Vacuum (Distributor Degrees at Inches of Mercury)	0° @ 4.5" to 8"		0° @ 7.2" to 8.9"		0° @ 6"to 9"			
	6 to 9° @ 12"		4.5 to 7.5° @ 12"		4.5 to 7.5° @ 12"			
	11.5 to 14.5° @ 16.5"		7.5 to 10.5° @ 14.5"		7.5 to 10.5° @ 14.3"			
Breaker Point Gap	.014" to .019"		.014" to .019"		.014" to .019"			
Dwell Angle	28° to 33°		One Set Points 27° to 32°		One Set Points 27° to 32°			
			Both Sets Points 34° to 40°		Both Sets Points 34° to 40°			
Breaker Arm Spring Tension	17 to 20 oz.		17 to 21.5 oz.		17 to 21.5 oz.			
Condenser Capacity	.25 to .285 mfd.		.25 to .285 mfd.		.25 to .285 mfd.			
Shaft Side Play	.000" to .003"*		.000" to .003"*		.000" to .003"*			
Shaft End Play (After Assembly)	.003" to .017"		.003" to .010"		.003" to .010"			
Rotation	Counter-Clockwise		Counter-Clockwise		Counter-Clockwise			
Spark Plug Type	J-12Y Champion		J-10Y Champion		J-10Y Champion			
Size	14 MM—⅜ Reach		14 MM—⅜ Reach		14 MM—⅜ Reach			
Gap	.035"		.035"		.035"			
Firing Order	1-8-4-3-6-5-7-2		1-8-4-3-6-5-7-2		1-8-4-3-6-5-7-2			
Ignition Timing	10° BTC		10° BTC		10° BTC			
Coil	Chrysler	Prestolite	Chrysler	Essex	Chrysler	Prestolite	Chrysler	Essex
Identification No.	2444242	200759	2444241	67-160-4	2444242	200759	2444241	67-160-4
Primary Resistance @ 70°-80° F.	1.65-1.79 ohms		1.41-1.55 ohms		1.65-1.79 ohms		1.41-1.55 ohms	
Secondary Resistance @ 70°-80° F.	9400-11700 ohms		9200-10600 ohms		9400-11700 ohms		9200-10600 ohms	
Ballast Resistor	2095501				2095501			
Resistance @ 70°-80° F.	0.5-0.6 ohms				0.5-0.6 ohms			
Current Draw (Coil and Ballast Resistor in Circuit)								
Engine Stopped	3.0 Amperes				3.0 Amperes			
Engine Idling	1.9 Amperes				1.9 Amperes			

*Service wear tolerance should not exceed .006 inch.

SPECIFICATIONS—(Continued)

BULB CHART

BULB	VALIANT	PLYMOUTH
Sealed Beam—Lo-Beam	—	4002
Sealed Beam—Hi-Beam	—	4001
Single Beam 2 filament	6012	—
Tail, Stop & Turn Signal	1034	1034
Park & Turn Signal	1034	1034
Back-Up Lamps	1073	1073
License Lamp	67	67
Trunk and/or Under Hood Lamp	1004	1004
Glove Compartment	1891	1891
Radio	53 X	1892-AM 57-FM
Transmission Control Push Buttons	53 X	(a)
Handbrake Indicator	57	57
Dome Lamp	1004	1004
Map Lamp	90	90
Clock	—	(a)
Heater and/or A.C. Control P/B	—	(a)
Turn Signal Indicator	57	57
High Beam Indicator	57	57
Oil Pressure Indicator	57	57
nstrument Cluster Illumination	57	57

(a) Included in instrument cluster lighting.

FUSE CHART

Circuit	Fuse Type	Ampere Rating
Radio	3 AG/AGC	7.5 AMP
Heater or Air Conditioning	3 AG/AGC	20 AMP
Accessories	3 AG/AGC	15 AMP
Cigar Lighter	3 AG/AGC	20 AMP
Tail, Stop, Dome	3 AG/AGC	20 AMP
Instrument Lamps	3 AG/AGC	2 AMP

CIRCUIT BREAKER CHART

Circuit Breaker	Circuit Breaker Location	Ampere Rating
Windshield Wiper (Variable Speed)	Back of Wiper Switch	6 AMP
Windshield Wiper (Single Speed)	Integral with Wiper Switch	5 AMP
Lighting System	Integral with Headlamp Switch	15 AMP
Elec. Window Lifts, Power Seats, Top Lift*	Behind left front kick panel	30 AMP

*Electric Window Lifts and Power Seats—Plymouth only.

SPECIAL TOOLS

ELECTRICAL

C-707	Point Gap Indicating Tool
C-744	Test Lamp
C-770	Commutator Undercutter
C-828	Tool Kit—Generator Regulator
C-3379	Belt Gauge Tool
C-3296	High Voltage Tester
C-3769	Installer—Drive End Housing Bearing
C-3770—A	Remover—Rectifier End Housing Bearing
C-3744	Puller—Distributor Shaft Bushings
C-3829	Tester—Alternator-Diode
C-3855	Holders Armature Brush Set
C-3900	Slip Ring Installer
C-3921	Installer and Locator—Alternator Bearing Grease Retainer
C-3925	Support Alternator Rectifier End Shield Supporting—End Shield Bearing Removing and Installing
C-3928	Remover and Installer—Alternator Rectifier Diodes
C-3934	Pulley Removing Tool (Power Steering Pump Pulley Removing Tool)
C-3944	Remover and Installer—Starter Housing Bushings
SP-3375	Adapters—Bearing Remover
SP-3381	Installer—Rectifier End Housing Bearing
MT-379	Battery Tester
MTU-36	Spring Scale
MT-310	Open Circuit Voltage Tester
MX-75	Battery Terminal Cleaner Tool
C-3041	Distributor Drive Shaft Bushing-Remover and Installer
C-3428	Steering Wheel Puller
C-3674	Headlamp Aimer Kit
C-3826	Gauge Tester

PART 1
BATTERY

1. BATTERY VISUAL INSPECTION

(1) Protect the fender paint finish with fender covers.

(2) Inspect the battery carrier and fender side panel for damage caused by loss of acid from the battery.

(3) Remove the battery hold-down clamp and clean the top of the battery with a solution of clean warm water and baking soda. Scrub areas with a stiff bristle brush being careful not to scatter corrosion residue with the bristles. Finally wipe off with a cloth moistened with ammonia or a baking soda and water solution.

CAUTION: Keep cleaning solution out of battery cells to eliminate weakening the electrolyte.

(4) Inspect the cable. Replace damaged or frayed cables.

(5) Inspect the terminal posts to see that they are not deformed nor broken. Clean the tapered battery terminals and the inside surfaces of the clamp terminals with the terminal cleaning tool, as shown in Figures 1 and 2.

(6) Examine the battery case for cracks and top of battery, and raised cells. Inspect sealing compound for leaks. Reseal as necessary.

(7) Tighten the battery hold-down screw nuts to 3 foot-pounds torque.

(8) **Observe the polarity of the terminals of battery to be sure the battery is not reversed** and connect the cable clamps to the battery posts and tighten securely. Coat all connections with light mineral grease or petrolatum.

(9) If the electrolyte level is low, fill to recommended level with mineral-free water.

2. SPECIFIC GRAVITY TEST

A hydrometer is used to measure the specific gravity of the electrolyte in the battery cells. This gives an indication of how much unused sulphuric acid remains in the solution. **Hydrometer floats are calibrated to indicate correctly only at one fixed temperature.**

The specific gravity of the battery electrolyte varies not only with the quantity of acid in solution but also with temperature. Draw electrolyte in and out of the hydrometer barrel several times to bring the temperature of the hydrometer float to that of the acid in the cell and then measure the electrolyte temperature in the cell. The temperature correction amounts to .004 specific gravity points for each 10 degrees Fahrenheit change in temperature.

The liquid level of the battery cell should be at normal height and the electrolyte should be thoroughly mixed with any battery water which may have just been added by charging the battery before taking any hydrometer readings. See "Adjustment of Acid Gravity".

A fully charged battery has a specific gravity reading of 1.255 to 1.275 (all batteries for use in temperate climates).

If the battery specific gravity is below 1.220, re-

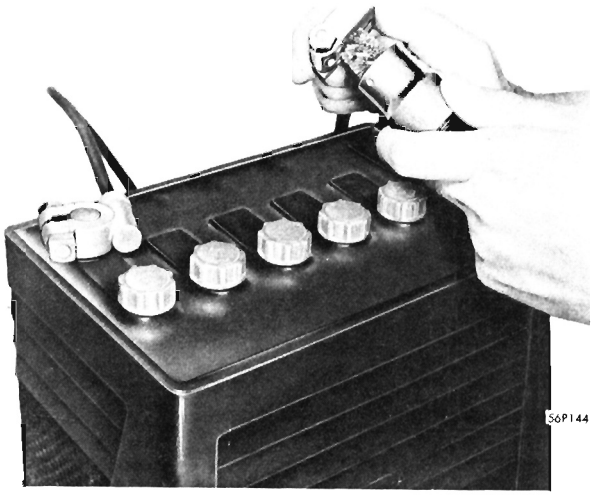


Fig. 1—Cleaning the Inside of Cable Clamp

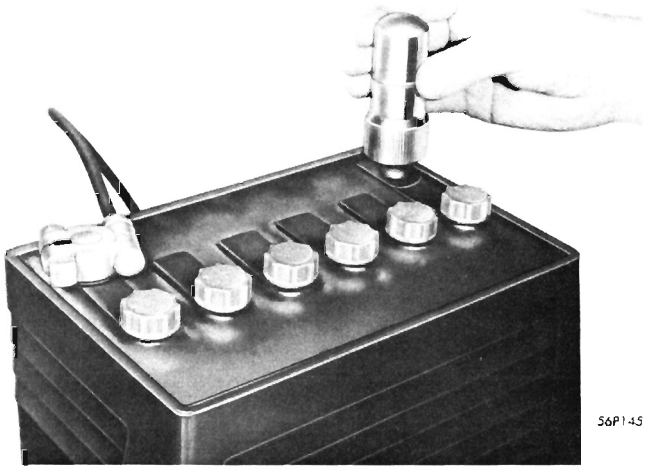


Fig. 2—Cleaning the Outside of Battery Post

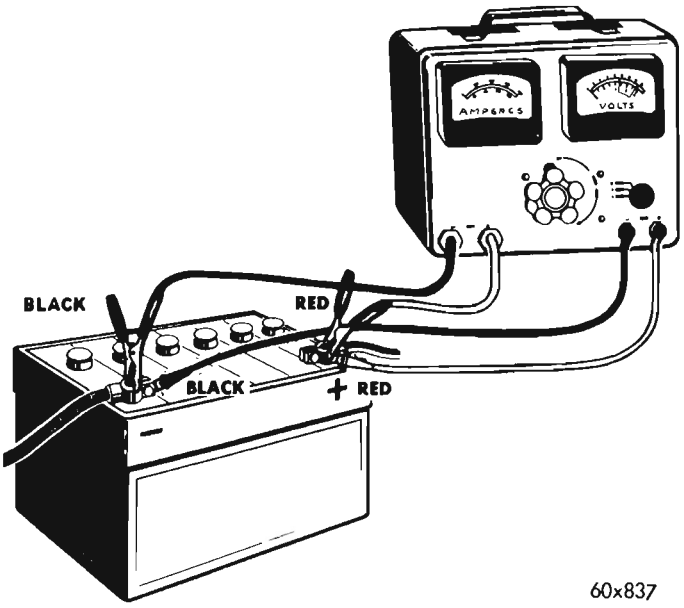


Fig. 3—High Rate Discharge Test

charge the battery to a full charge, then proceed with the battery "Voltage Tests" and "Battery Capacity Tests".

3. VOLTAGE TESTS (Open Circuit)

NOTE: Freshly charged batteries may have a "surface charge" which causes high and inaccurate readings unless properly dissipated. If battery is in the vehicle, turn the headlights on for one to three minutes to remove surface charge. Then turn lights off and wait several minutes before taking another reading.

To make a battery test, contact the meter prods (Tool MT-379) to the proper cell terminals (red to positive, black to negative), using caution not to connect across more than one cell. The point of prod will have to be pushed through sealing compound to make contact with buried link for each cell reading.

The individual cell readings should not vary more than .05 volt between any two cells. A battery varying more than .05 volt between any two cells should be **recharged** and "high rate discharge tester" should be used to test the battery before discarding the battery as unsuitable for use.

NOTE: The cell connectors are not exposed, therefore it will be necessary to pierce the cell covers to contact the connector strips to obtain individual cell voltages. After making tests, the cell covers should be sealed.

CAUTION: Do not use an open flame near the battery.

4. HIGH RATE DISCHARGE TEST OF BATTERY CAPACITY

Satisfactory capacity tests can be made only when battery equals or exceeds 1.220 specific gravity at 80 degrees Fahrenheit. If reading is below 1.220, the battery should be slow charged until fully charged in order to secure proper test results.

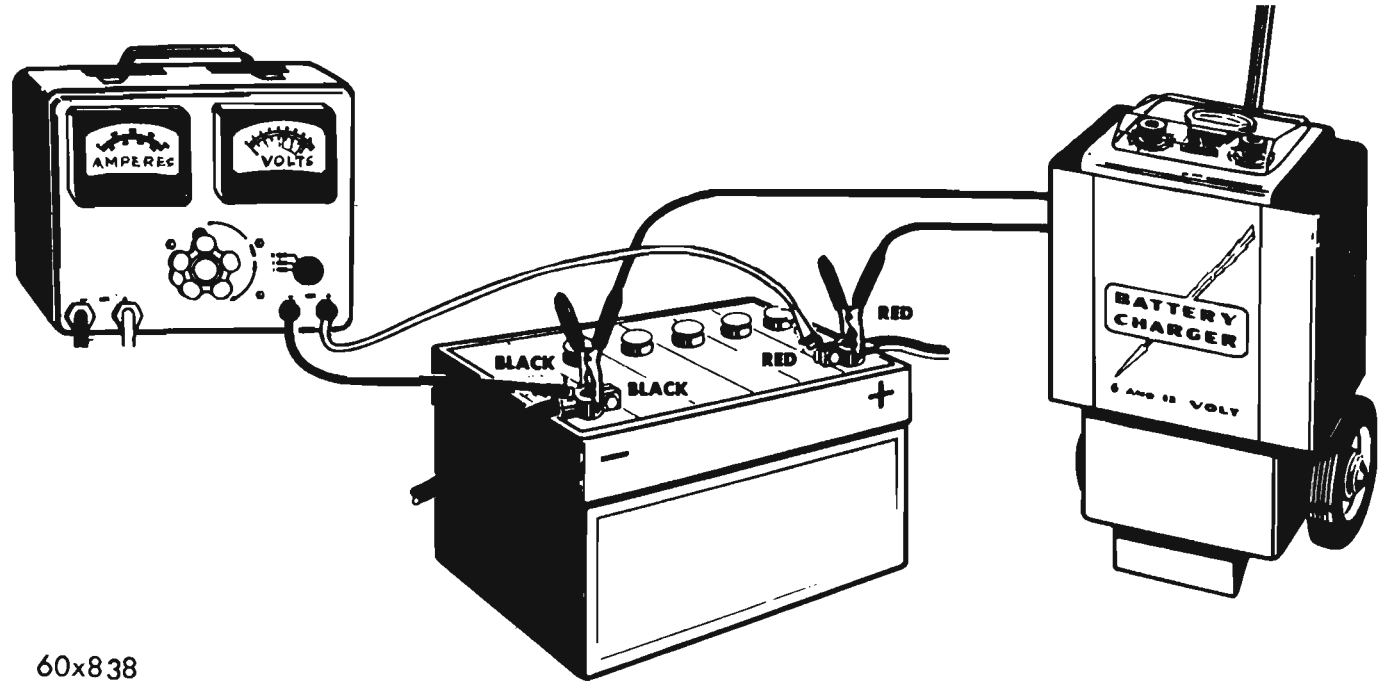


Fig. 4—Three Minute Charge Test

(1) Turn the control knob of the battery starter tester to the **OFF** position.

(2) Turn the voltmeter selector switch to the 16 volt position (test units so equipped).

(3) Connect the test ammeter and voltmeter positive leads to the battery positive terminal and ammeter and voltmeter negative leads to the battery negative terminal (Fig. 3).

NOTE: The voltmeter clips must contact the battery posts or cable clamps and not the ammeter clips.

(4) Turn the control knob clockwise until ammeter reading is equal to three times the ampere hour rating of the battery.

(5) Maintain the load for 15 seconds, voltmeter should read 9.5 volts or more, which will indicate that the battery has good output capacity.

(6) Turn the control knob to the **OFF** position.

5. CHARGING THE BATTERY

If the voltage in "The High Rate Discharge Test" was under 9.5 volt, the battery should be test charged to determine whether the battery can be satisfactorily charged.

Three Minute Charge Test (Fig. 4)

NOTE: This test should not be used if battery temperature is below 60 degrees F.

(1) Connect the positive (+) charger lead to the battery positive terminal and the negative (—) charger lead to the battery negative terminal.

IMPORTANT: Be sure of correct battery polarity when charging the batteries.

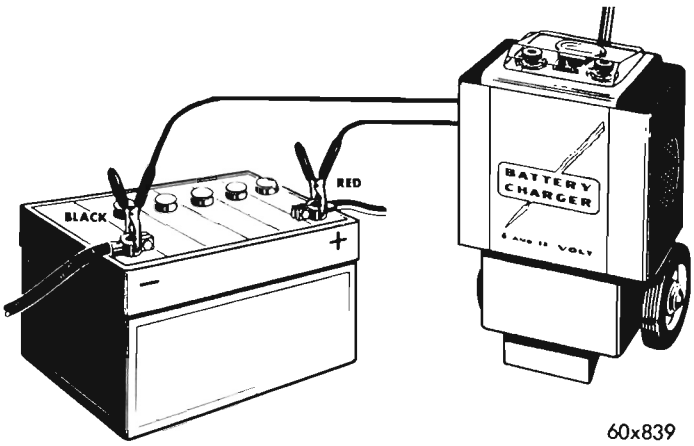
(2) Trip the charger power switch to the **ON** position. Turn the charger timer switch past "three minutes" then back to "three minutes".

(3) Adjust the charge switch to the highest possible rate not exceeding 40 amperes.

(4) When the timer switch cuts off at end of 3 minutes, turn the timer switch back to fast charge.

(5) Use the 4 volt scale of the battery starter tester voltmeter (test units so equipped) and quickly measure the voltage across each cell while the battery is being fast charged. A faulty cell or cells will be detected by a cell voltage variation of more than .1 volt.

(6) If the cell voltages are even within .1 volt, use 16 volt scale of the battery starter tester (test units so equipped) and measure the total voltage of the battery posts while the battery is being fast charged. If the total voltage during the charge exceeds 15.5 volts, the battery is sulphated and should be cycled and slow-charged until specific gravity reaches 1.260 (See "Slowing Charging").



60x839

Fig. 5—Fast Charging the Battery

If the specific gravity remains constant after testing the battery at one hour intervals for three hours, the battery is at its highest state of charge.

(7) Make another capacity test. If the capacity test does not meet specifications, replace the battery.

NOTE: A slow charge is preferable to bring the battery up to a full charge.

Safe slow charging rates are determined by allowing one ampere per positive plate per cell. The proper slow charging rate would be 3 amperes for a 38 ampere hour battery, 4 amperes for a 48 ampere hour, 5 amperes for a 59 ampere hour battery and 6 amperes for a 70 ampere hour battery.

Fast Charging the Battery (Fig. 5)

If adequate time for a slow charge is not available, a high rate (FAST) charge is permissible and will give a sufficient charge in one hour, enabling the battery and alternator to continue to carry the electrical load.

Connect the positive (+) battery charger lead to the battery positive terminal and the negative (—) battery charger lead to the battery negative terminal.

CAUTION: The battery can be damaged beyond repair unless the following precautions are taken:

(1) The battery electrolyte temperature must **NEVER** exceed 125 degrees Fahrenheit.

If this temperature is reached, the battery should be cooled by reducing the charging rate or remove the battery from the circuit.

(2) As the batteries approach full charge the electrolyte in each cell will begin to gas or bubble. Excessive gassing must not be allowed.

(3) Do not fast charge longer than one hour.

Remember to use the temperature correction when when checking specific gravity.

If the battery does not show a significant change in the specific gravity after one hour of "FAST" charge, the slow charge method should be used.

NOTE: The manufacturers of high rate charging equipment generally outline the precautions and some models have thermostatic temperature limiting and time limiting controls.

WARNING: When batteries are being charged, an explosive gas mixture forms beneath the cover of each cell. Do not break live circuits at the terminals of the batteries on charge. A spark will occur when the live circuit is broken. Keep all open flames away from the battery.

Slow Charging Batteries to Remove Sulphation

To condition a battery that is sulphated, charge the battery for a minimum of 24 hours at a maximum charging rate of (4) amperes. As the battery approaches full charge, test the specific gravity at hourly intervals. With no rise in specific gravity for three successive readings, the battery is charged to its peak capacity.

SERVICE DIAGNOSIS

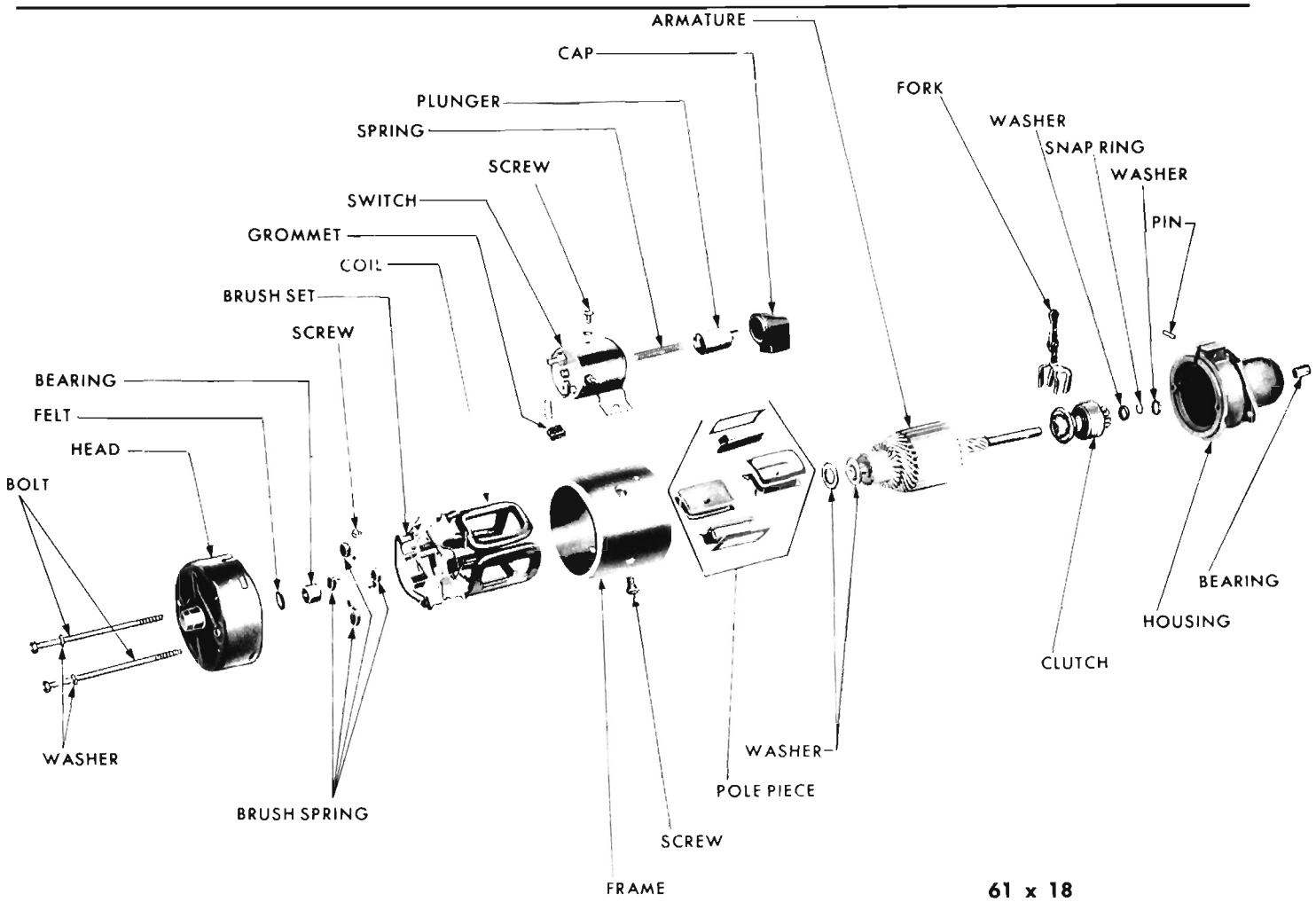
BATTERY TESTING CHART

Hydrometer Test (corrected to 80° F.)	State of Charge or Battery Condition	Correction
Less than 1.220 SP. GR.	Battery low.	Recharge the battery. Give a high rate discharge test for capacity. If the cells test O.K., recharge and adjust the gravity of all cells uniformly. Test the voltage regulator setting. Thoroughly test the electrical system for short circuits, loose connections, corroded terminals, etc.
Cells show more than 25 points (.025 Specific Gravity) variation.	Short circuit in low cell. Loss of electrolyte by leakage or excessive overcharge. Improper addition of acid. Natural or premature failure. Cracked case.	Try to recharge the battery. See "Charging the Battery". Test battery for capacity. Install a new battery if necessary.

Open Circuit Voltage Test	State of Charge or Battery Condition	Correction
Cells showing more than 1.220 specific gravity.	Satisfactory.	No correction required if the variation among cells is not over .05 volt. If the variation is more than .05 volt, recharge. Give high rate discharge capacity test. If cells test O.K., adjust gravity of all cells uniformly.
Cells showing less than 1.220 specific gravity, but not more than .05 volt variation.	Questionable.	Recharge the battery. Give high rate discharge test for capacity. If the cells test O.K., recharge. Test the voltage regulator setting. Thoroughly test the electrical system for short circuits, loose connections, corroded terminals, etc.
Cells showing more than .05 volt variation.	Short circuit in low cell. Loss of electrolyte by leakage or excessive overcharge. Improper addition of acid or "Dopes". Cracked Case.	Recharge battery. See "Charging the Battery".

SERVICE DIAGNOSIS—(Continued)

Cranking Test	Natural or premature failure Possible Cause	Correction
If the voltage drop is more than 0.3 volts (3/10) between the starting motor cable and the vehicle frame while cranking look for:	Poor contact between the cable terminal and the vehicle frame or between the cable clamp terminal and the battery post or the starter switch contacts. Frayed, corroded or broken cable.	Locate the high resistance: repair or replace as necessary.
While operating the starting motor, ignition "OFF" check the voltage of all cells. If the voltage varies more than 0.15 volt between cells, look for:	Faulty cell or cells.	Compare the voltage readings with the hydrometer reading—low voltage is usually accompanied by low gravity. Try to recharge the battery. See "Charging the Battery".



61 x 18

Fig. 1—Starting Motor (Disassembled View) (Typical)

PART 2

STARTING MOTOR (DIRECT DRIVE)

The Chrysler built starting motor (Fig. 1) is a 12-volt, four coil assembly. The starter drive is an overrunning clutch type with a solenoid shift type switch mounted on the starting motor.

The brush holders are riveted to a separate brush plate and are not serviced individually.

SERVICE PROCEDURES

1. STARTING MOTOR CIRCUIT TESTS

Insulated Circuit Test

(1) Test the battery electrolyte specific gravity. The specific gravity should be 1.220 or above. If the battery specific gravity is below 1.220, recharge the battery to a full charge before proceeding with the test.

(2) Turn the voltmeter selector switch to the 4 volt position.

(3) Disconnect the ignition coil secondary cable.

(4) Connect the voltmeter positive lead to the battery positive post and the voltmeter negative lead to the solenoid connector which connects to the starter field coils.

NOTE: The voltmeter will read off the scale to the right until the starter is actuated.

(5) Connect the remote control starter switch to the battery and the solenoid terminal of the starter relay.

(6) Crank the engine with the remote control starter switch and observe the voltmeter reading. The voltmeter reading should not exceed .3 volt. A voltmeter reading of .3 volt or less indicates the voltage drop is normal in the cables, starter relay switch, solenoid switch and connections between the battery and the starting motor are normal. See "Starter Ground Circuit Test".

If the voltmeter reading is more than .3 volt, it indicates high resistance in the starter insulated circuit. Make the following test to isolate the point of excessive voltage loss.

(7) Remove the voltmeter lead from the solenoid connector and connect to the following points, repeating the test at each connection. The starter terminal of the solenoid, battery terminal of the solenoid, battery cable terminal at the solenoid, starter relay and the cable clamp at the battery.

(8) A small change will occur each time a normal portion of the circuit is removed from the test. A definite change in the voltmeter reading indicates that the last part eliminated in the test is at fault.

Maximum allowable voltage loss is as follows:

Battery insulated cable	.2 volt
Solenoid Switch	.1 volt
Each connection	.0 volt

Replace the faulty cables. Clean and tighten all connections.

Starter Ground Circuit Test

(1) Connect the voltmeter positive lead to the starter housing and the negative voltmeter lead to the battery negative post.

(2) Crank the engine with a remote control starter switch and observe the voltmeter reading. The voltmeter reading should not exceed .2 volt. A reading of .2 volt or less indicates voltage loss in the ground cable and connections are normal. If the voltmeter reading is more than .2 volt, it indicates excessive voltage loss in the starter ground circuit. Make the following tests to isolate the point of excessive voltage loss. Repeat the test at each connection.

(a) Starter drive housing.

(b) Cable terminal at the engine.

(c) Cable clamp at the battery.

A small change will occur each time a normal portion of the circuit is removed from the test. A definite change in the voltmeter reading indicates that the last part eliminated in the test is at fault.

Maximum allowable voltage loss is as follows:

Battery ground cable	.2 volt
Engine ground circuit	.1 volt
Each connection	.0 volt

2. STARTING MOTOR

Removal

(1) Disconnect the ground cable at the battery.

(2) Remove the starter cable at the starter.

(3) Disconnect the solenoid lead wire from the solenoid.

(4) Remove the bolts attaching the starting motor to the flywheel housing and remove the starting motor.

3. TESTING THE STARTING MOTOR (Bench Test)

Free Running Test

(1) Place the starter in a vise equipped with soft jaws and connect a fully-charged, 12 volt battery to the starter.

(2) Connect a test ammeter (100 amperes scale) and carbon pile rheostat in series with the battery positive post and the starter terminal.

(3) Connect the voltmeter (15 volt scale) across the starter.

(4) Rotate the carbon pile to the full-resistance position.

(5) Connect the battery cable from the battery negative post to the starter frame.

(6) Adjust the rheostat until the battery voltage shown on the voltmeter reads 11 volts.

The current draw should be 78 amperes maximum at 3800 minimum rpm.

Stall Test

(1) Install the starting motor in the test bench.

(2) Follow the instructions of the test equipment manufacturer and check the stall torque of the starter against the following specifications.

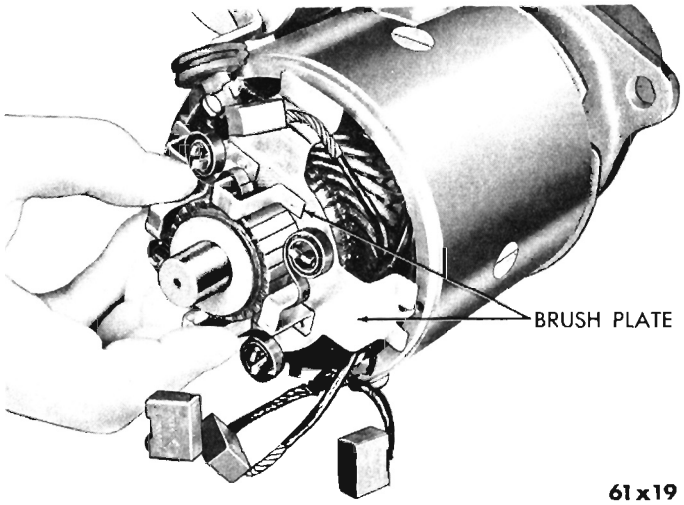


Fig. 2—Removing the Brush Ring

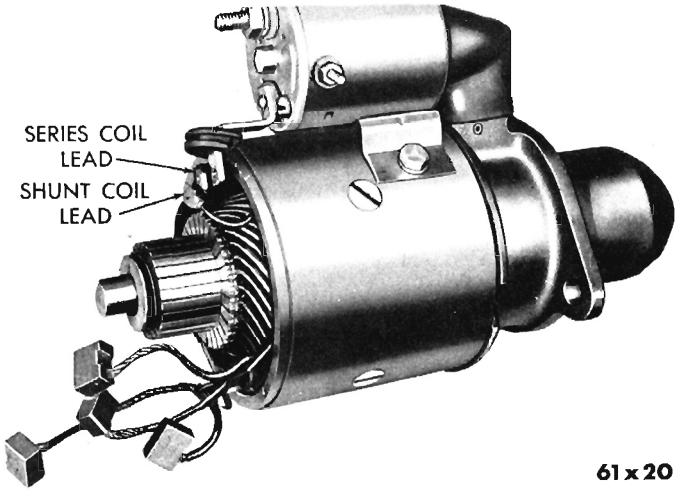


Fig. 3—Field Coil Leads Disconnected from the Solenoid Connector

(3) With the applied battery voltage adjusted to 4 volts, the stall torque should be 8.5 foot-pounds minimum with a current draw of 350 amperes.

4. STARTER DISASSEMBLY (Fig. 1)

(1) Remove the through bolts and tap the commutator end head from the field frame.

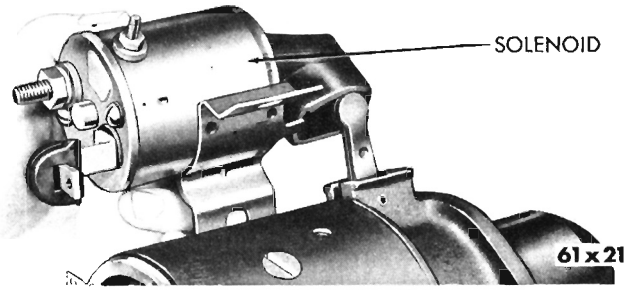


Fig. 4—Removing the Starter Solenoid

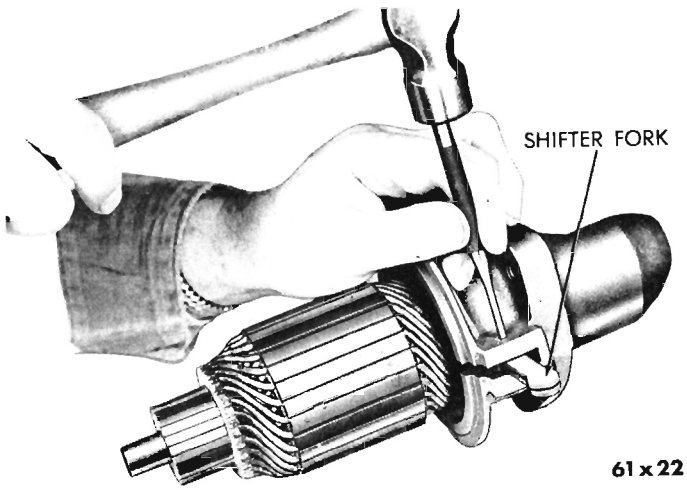


Fig. 5—Removing the Shifter Fork Pivot Pin

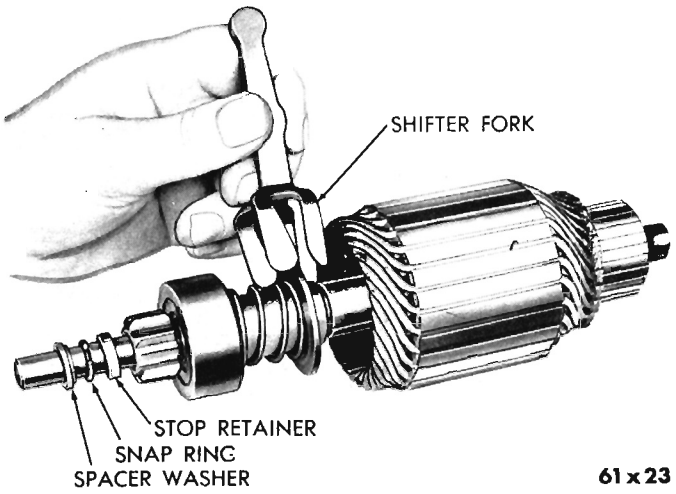


Fig. 6—Removing or Installing the Shifter Fork

(2) R move the thrust washers from the armature shaft.

(3) Lift the brush holder springs and remove the brushes from the brush holders.

(4) Remove the brush plate (Fig. 2).

(5) Disconnect the field coil leads at the solenoid connector (Fig. 3).

(6) Remove the solenoid attaching screws and remove the solenoid and boot assembly (Fig. 4).

(7) Drive out the over-running clutch shift fork pivot pin (Fig. 5).

(8) Remove the drive end pinion housing and spacer washer.

(9) Note the position of the shifting fork on the starter and remove the shifter fork (Fig. 6).

(10) Slide the over-running clutch pinion gear toward the commutator end of the armature, drive the stop retainer toward the clutch pinion gear to expose the snap ring and remove the snap ring.

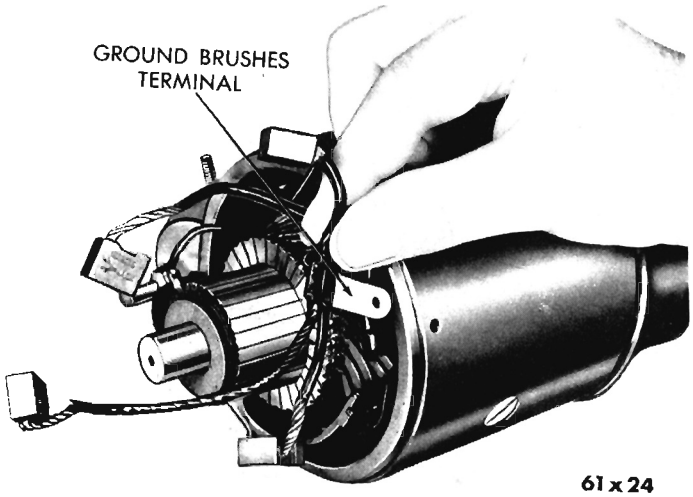


Fig. 7—Removing or Installing the Ground Brushes Terminal

(11) Slide the over-running clutch drive from the armature shaft.

(12) If it is necessary to replace the field coils, remove the ground brushes terminal attaching screw and raise the brushes with the terminal and shunt wire up and away from the field frame (Fig. 7). Remove the pole shoe screws with a special pole shoe impact screwdriver, Tool C-3475.

Cleaning and Inspection

(1) Do not immerse the parts in a cleaning solvent. Immersing the field frame and coil assembly and/or armature will damage the insulation. Wipe these parts with cloth **only.**

(2) Do not immerse the drive unit in a cleaning solvent. The drive clutch is pre-lubricated at the factory and solvent will wash lubrication from the clutch.

(3) The drive unit may be cleaned with a brush moistened with cleaning solvent and wiped dry with a cloth.

5. BRUSHES AND SPRINGS—REPLACEMENT

(1) The brushes that are worn more than ½ the length of the new brush, or are oil-soaked, should be replaced. The brushes and springs can be replaced after removing the commutator end head and the brush plate.

(2) Lift the brushes; disengage the brushes from the brush holders and remove the brush plate.

(3) Disconnect the field lead wires at the solenoid connector (Fig. 3).

(4) Remove the screw attaching the ground brush terminal to the field frame and raise the brushes and terminal up and away from the field frame (Fig. 7).

(5) Remove the field terminal plastic covering and remove the old brushes. Use side cutters to break the weld by rolling the brush wire off the terminal.

(6) Drill a .174 to .184 inch hole, $\frac{3}{16}$ inch from the top of the field coil terminal. Use an $\frac{11}{64}$ inch drill.

CAUTION. Do not damage the field coil during the drilling operation.

(7) Position the new brushes and terminal and install the brush terminal retaining screw.

(8) The brush springs can be removed by spreading the retainers and disengaging the springs from the retainer legs.

(9) Measure the brush spring tension with a spring scale hooked under the spring near the end. Pull the

scale on a line parallel to the edge of the brush and take a reading just as the spring end leaves the brush. The spring tension should be 32 to 48 ounces. Replace the springs that do not meet specifications.

6. TESTING THE ARMATURE

Testing the Armature for Short Circuit

Place the armature in the growler (Fig. 8) and hold a thin steel blade parallel to the core and just above it, while slowly rotating the armature in the growler. A shorted armature will cause the blade to vibrate and be attracted to the core. Replace a shorted armature.

Testing Armature for Ground

Touch the armature shaft and end of a commutator bar with a pair of test lamp test prods (Fig. 9). If the lamp lights, it indicates a grounded armature. Replace a grounded armature.

Testing Commutator Runout, Refacing and Undercutting

Place the armature in a pair of "V" blocks and measure the runout with a dial indicator. Test both the shaft and the commutator. A bent shaft requires replacement of the armature. When the commutator runout exceeds .003 inch, the commutator should be refaced. Remove only sufficient metal to provide a smooth, even surface.

7. TESTING THE FIELD COILS FOR GROUND

(1) Remove the through bolts and remove the commutator end frame.

(2) Remove the brushes from the brush holders and remove the brush ring (Fig. 2).

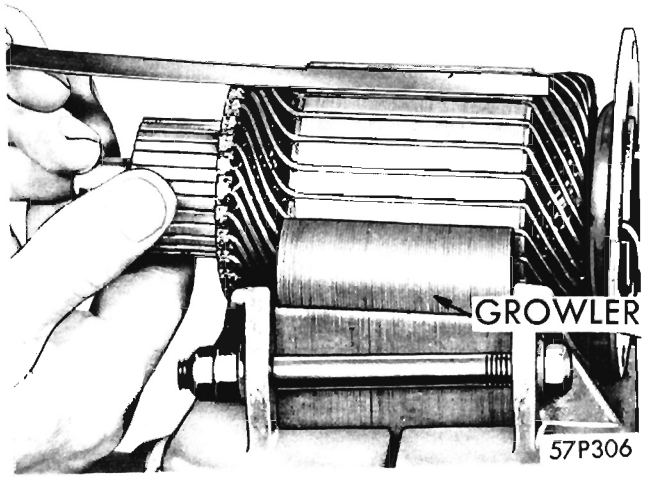


Fig. 8—Testing Armature for Short

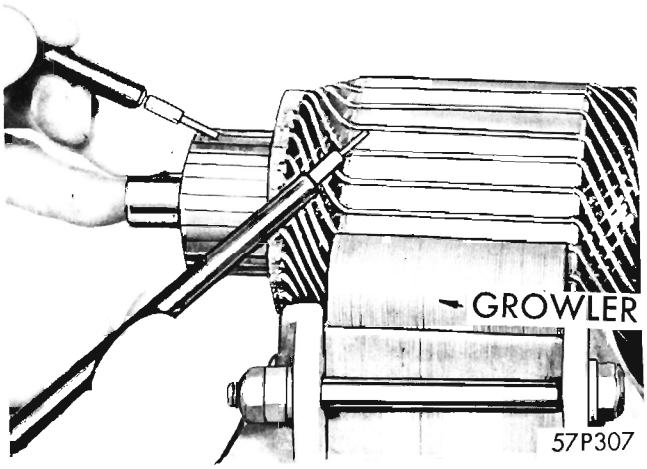


Fig. 9—Testing Armature for Ground

(3) Disconnect the field lead wires at the solenoid connector and separate the field leads to make sure they do not touch the solenoid connector (Fig. 3).

(4) Remove the ground brushes attaching screw and raise the brushes with the terminal and shunt wire up and away from the field frame (Fig. 7).

(5) Touch one probe of the test lamp to the series field coil lead and the other probe to the field frame (Fig. 10). The lamp should not light.

(6) Touch one probe to the shunt field coil lead and the other probe to the field frame (Fig. 11).

If the lamp lights in either test steps (5) or (6), the field coils are grounded. If the field coils are grounded, test each coil separately after unsoldering the connector wires. Replace the grounded field coils.

(7) Touch each of the brush holders with one test probe, while holding the other test probe against the brush ring. Two brush holders that are 180 degrees

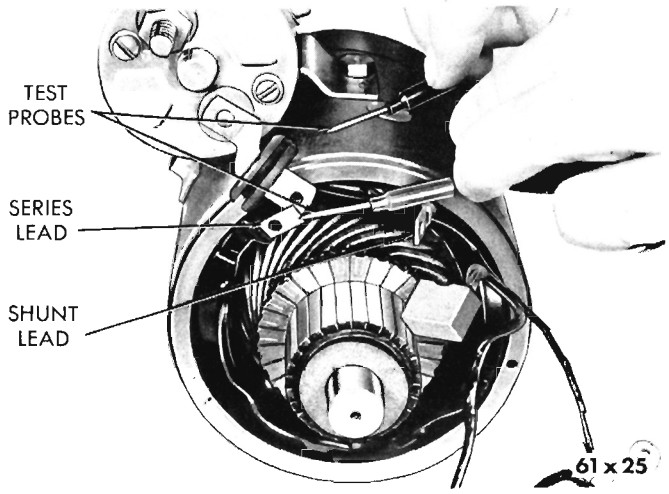


Fig. 10—Testing the Series Coil for Ground

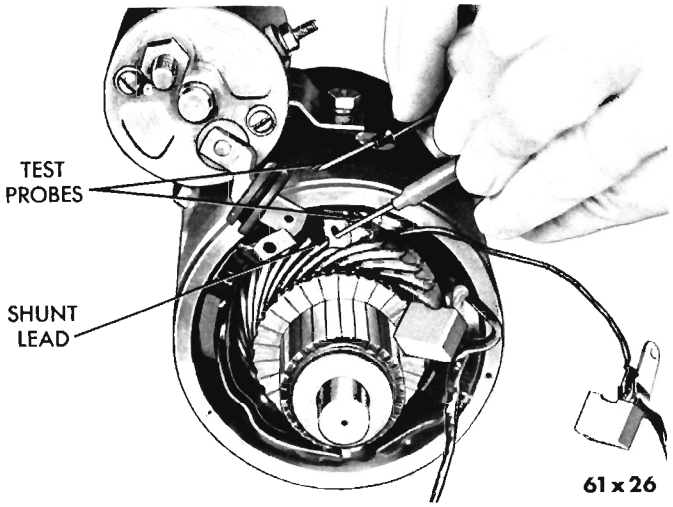


Fig. 11—Testing the Shunt Coil for Ground

apart should cause the test lamp to light as they are intentionally grounded. The other two brush holders (Fig. 12) should not cause the lamp to light when tested, as they are insulated. If the insulated brush holders cause the lamp to light when tested, it indicates that the brush holders on the brush ring are grounded. Replace the brush ring assembly if the brush holders are grounded.

8. REPLACING THE FIELD COILS

A pole shoe impact screwdriver Tool C-3475 should be used to remove and install the field coils to prevent damage to the pole shoe screws and for proper tightening. The pole shoes that are loose and not properly seated may cause the armature core to rub the pole shoes. This will decrease the starter efficiency and damage the armature core.

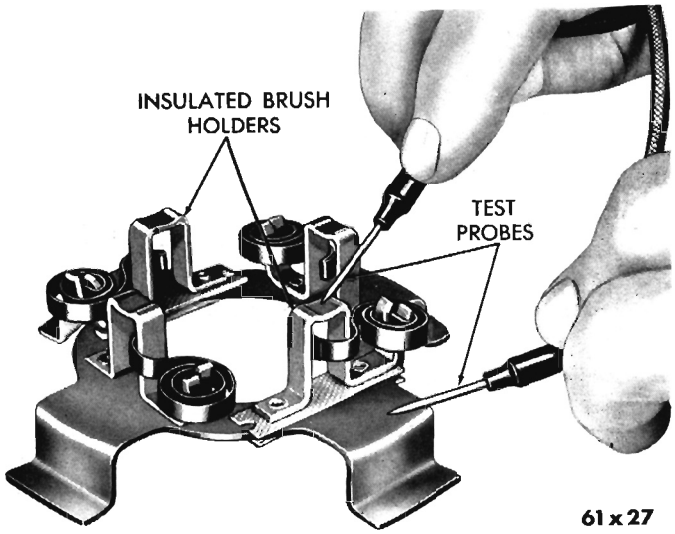


Fig. 12—Testing the Insulated Brush Holder for Ground

9. SERVICING THE BRUSHES

Inspect the armature shaft bearing surfaces and bushings for wear by placing the armature core in a vise equipped with soft jaws. Do not squeeze tightly. Try the commutator end frame, the drive end frame, and armature support bushings for wear by placing them on shafts and inspecting for side play. Replace the commutator end frame and bushing assembly if the bushing is worn, also, replace the drive end bushing if it is worn. The bushing should be well soaked in SAE 30W engine oil before it is installed.

10. SERVICING THE DRIVE UNIT

Place the drive unit on the shaft and, while holding the armature, rotate the drive pinion. The drive pinion should rotate smoothly in one direction (not necessarily easily), but should not rotate in the opposite direction. If the drive unit does not function properly, or the pinion is worn or burred, replace the drive unit.

11. STARTER ASSEMBLY (Fig. 1)

(1) Lubricate the armature shaft and splines with SAE 10W oil or 30W rust preventive oil.

(2) Install the starter drive, stop collar (retainer), the lock ring and the spacer washer.

(3) Install the shifter fork over the starter drive spring retainer washer with the narrow leg of fork toward commutator (Fig. 6). This is important, if the fork is not properly positioned, the starter gear travel will be restricted causing a lockup in the clutch mechanism.

(4) Install the drive end (pinion) housing on the armature shaft, indexing the shifting fork with the slot in the drive end of the housing.

(5) Install the shifter fork pivot pin (Fig. 5).

(6) Install the armature with the clutch drive, shifter fork, and pinion housing; slide the armature into the field frame until the pinion housing indexes with the slot in the field frame.

(7) Install the solenoid and boot assembly (Fig. 4). Tighten bolts to 60 to 70 inch-pounds torque.

(8) Install the ground brushes (Fig. 7).

(9) Connect the field coil leads at the solenoid connector (Fig. 3).

(10) Install the brush holder ring (Fig. 2) indexing the tang of the ring in the hole of the field frame.

(11) Position the brushes in the brush holders. Be sure the field coil lead wires are properly enclosed behind the brush holder ring and that they do not interfere with the brush operation.

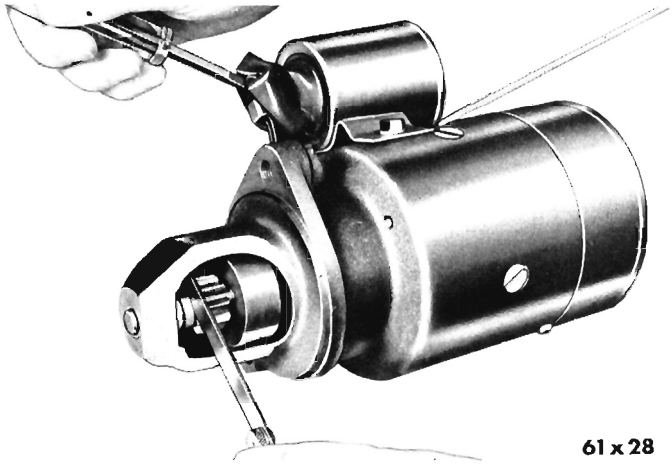


Fig. 13—Measuring the Starter Drive Pinion Clearance

(12) Install the thrust washers on the commutator end of the armature shaft to obtain .010 inch minimum end play.

(13) Install the commutator end head.

(14) Install the through bolts and tighten 40 to 50 inch-pounds torque.

12. ADJUSTING STARTER DRIVE GEAR (Pinion Clearance)

(1) Place the starter assembly in a vise equipped with soft jaws and tighten the vise sufficiently to hold the starter.

NOTE: Place a wedge or screwdriver between the bottom of the solenoid and the starter frame to eliminate all deflection in the solenoid when making the pinion clearance check. (Fig. 13).

(2) Push in on the solenoid plunger link (Fig. 13) (NOT THE FORK LEVER) until the plunger bottoms.

(3) Measure the clearance between the end of the pinion and pin stop with plunger seated and pinion pushed toward the commutator end. The clearance should be ⅛ inch. Adjust for proper clearance by loosening the solenoid attaching screws and move the solenoid fore and aft as required.

(4) Test the starter operation under a free running test.

13. STARTER INSTALLATION

(1) Before installing the starter, be sure the starter and flywheel housing mounting surfaces are free of dirt and oil. These surfaces must be clean to make good electrical contact.

(2) Position the starter to the flywheel housing removable seal (units so equipped).

(3) Install the starter from beneath the engine.

(4) Tighten the attaching bolts securely.

(5) Attach the wires to the solenoid switch and the starter terminal.

(6) Install the battery ground cable and test operation of the starter for proper engine cranking.

STARTING MOTOR - (REDUCTION GEAR TYPE)

The reduction-gear starting motor has an armature-to-engine crankshaft ratio of 45 to 1, a 3.5 to 1 reduction gear set is built into the motor assembly, which is housed in an aluminum die casting (Fig. 6). The starting motor utilizes a solenoid shift device. The housing of the solenoid is integral with the starting motor drive end housing.

SERVICE PROCEDURES

1. TESTING STARTER RESISTANCE AND CURRENT DRAW

(1) Test the battery electrolyte specific gravity. Specific gravity should be 1.220 or above. If the battery specific gravity is below 1.220, recharge the battery to full charge before proceeding with the test.

(2) Disconnect the positive battery lead from the battery terminal post. Connect an 0 to 300 scale ammeter between the disconnected lead and the battery terminal post.

(3) Connect a test voltmeter with 10 volt scale divisions between the battery positive post and the starter switch terminal at the starter solenoid.

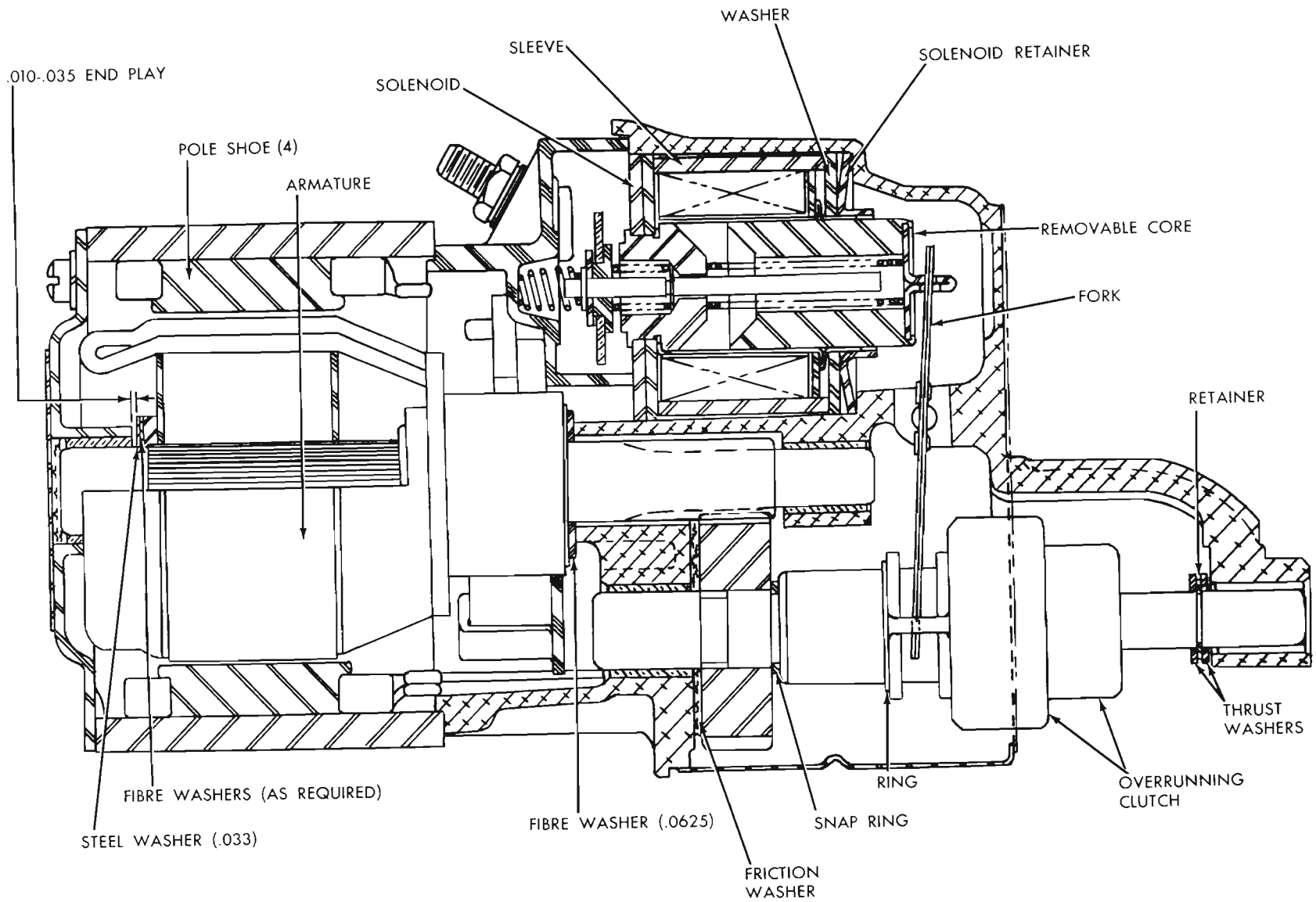


Fig. 1—Starting Motor Cross Section

(4) Crank the engine and observe the readings on the voltmeter and ammeter. The voltage should not exceed .3 volt. A voltage reading that exceeds .3 volt indicates there is high resistance caused from loose circuit connections, a faulty cable, burned starter relay or solenoid switch contacts. A high current reading combined with slow cranking speed, indicates that the starter should be removed and repaired.

2. STARTER GROUND CIRCUIT TEST

(1) Connect the voltmeter positive lead to the starter housing and the negative voltmeter lead to the battery negative post.

(2) Crank the engine with a remote control starter switch and observe the voltmeter reading. The voltmeter reading should not exceed .3 volt. A reading of .3 volt or less indicates voltage in the ground cable and connections is normal. If the voltmeter reading is more than .3 volt, it indicates excessive voltage loss in the starter ground circuit. Make the following tests to isolate the point of excessive voltage loss, repeating the test at each connection.

(a) Starter drive housing.
(b) Cable terminal at the engine.
(c) Cable clamp at the battery.

A small change will occur each time a normal portion of the circuit is removed from the test. A definite change in the voltmeter reading indicates that the last part eliminated in the test is at fault.

Maximum allowable voltage loss is as follows:

Battery ground cable	.2 volt
Engine ground circuit	.1 volt
Each connection	.0 volt

3. STARTING MOTOR

Removal

(1) Disconnect the ground cable at the battery.

(2) Remove the cable at the starter.

(3) Disconnect the solenoid lead wire at the solenoid terminals.

(4) Remove the one stud nut and one bolt attaching the starting motor to the flywheel housing and remove the starting motor.

4. TESTING THE STARTING MOTOR (Bench Test)

Free Running Test

(1) Place the starter in a vise and connect a fully-charged, 12 volt battery to the starter as follows:

(2) Connect a test ammeter (100 amperes scale) and carbon pile rheostat in series with the battery positive post and the starter terminal.

(3) Connect a voltmeter (15 volt scale) across the starter.

(4) Rotate the carbon pile to a full-resistance position.

(5) Connect the battery cable from the battery negative post to the starter frame.

(6) Adjust the rheostat until the battery voltage shown on the voltmeter reads 11 volts.

(7) The current draw should be as shown in "Specifications".

Locked Resistance Test

(1) Install the starter in a test bench.

(2) Follow the instruction of the test equipment manufacturer and test the locked resistance of the starter.

(3) With applied battery voltage adjusted to 4 volts, the amperage draw should be as shown in "Specifications".

Disassembly (Figure 1)

(1) Place the gear housing of the starter in a vise equipped with soft jaws. Use the vise as a support fixture only. **DO NOT** clamp.

(2) Remove the two through bolts and the starter end head assembly.

(3) Carefully pull the armature up and out of the gear housing, and the starter frame and field assembly. Remove the steel and fiber thrust washer.

NOTE: On 8 cylinder engines the starting motors have the wire of the shunt field coil soldered to the brush terminal. The 6 cylinder engines have the 4 coils in series and do not have a wire soldered to the brush terminal. One pair of brushes is connected to this terminal. The other pair of brushes is attached to the series field coils by means of a terminal screw. Carefully pull the frame and field assembly up just enough to expose the terminal screw and the solder connection of the shunt field at the brush terminal. Place two wood blocks between the starter frame and starter gear housing (Fig. 2) to facilitate removal of the terminal screw and the unsoldering of the shunt field wire at the brush terminal.

(4) Support the brush terminal by placing a finger behind the terminal and remove the terminal screw (Fig. 2).

(5) On 8 cylinder engine starting motors unsolder the shunt field coil lead from the starter brush terminal (Fig. 3). The 6 cylinder engine starting motors are a 4 series coil type.

(6) Remove the brush insulator which prevents

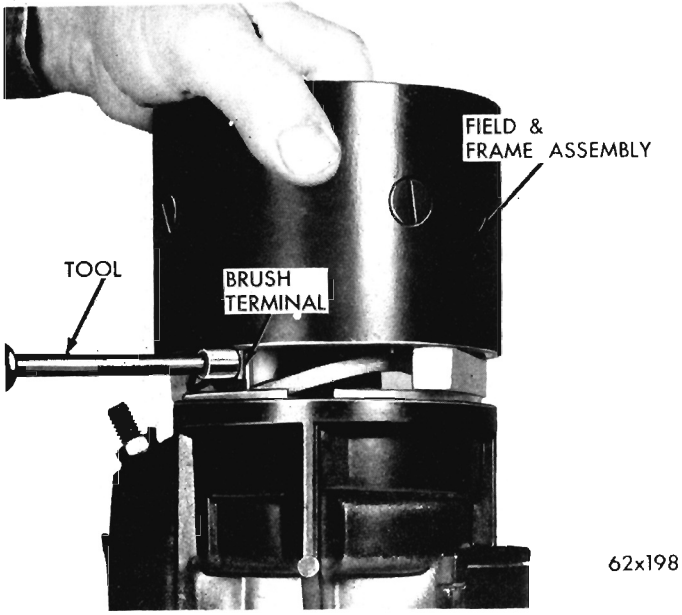


Fig. 2—Removing or Installing the Brush Terminal Screw

contact between the brush terminal and the gear housing (Fig. 4).

NOTE: The brush holder plate with the brush terminal, contact and brushes is serviced as an assembly.

(7) Thoroughly remove all old sealer around the brush holder plate and gear housing.

(8) Remove the screw attaching the brush holder plate to the starter gear housing (Fig. 4).

(9) On shunt type starters, unsolder the solenoid winding from the starter brush terminal (Fig. 5). The 4 series coil starters do not have a wire soldered to the brush terminal.

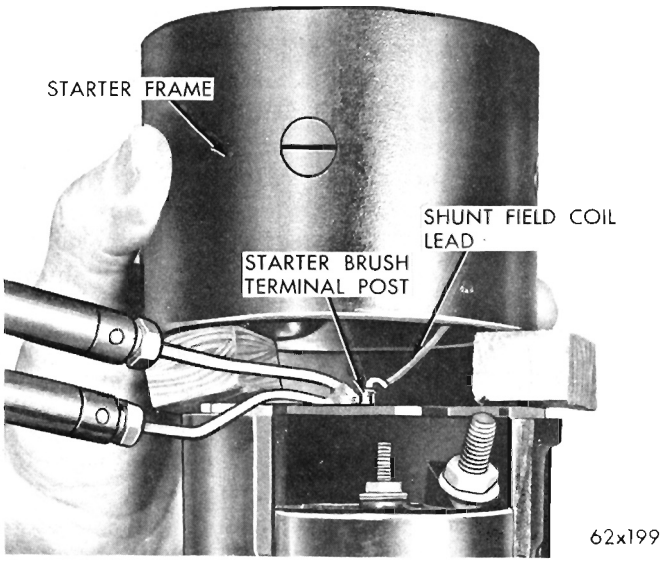


Fig. 3—Unsoldering the Shunt Coil Lead Wire

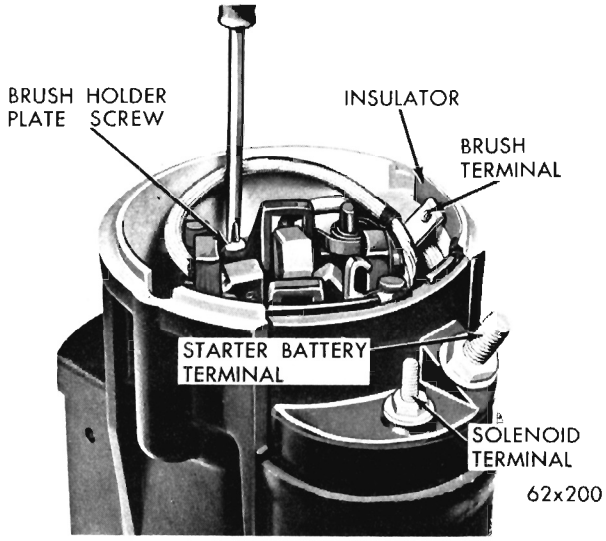


Fig. 4—Removing or Installing the Brush Holder Plate Screw

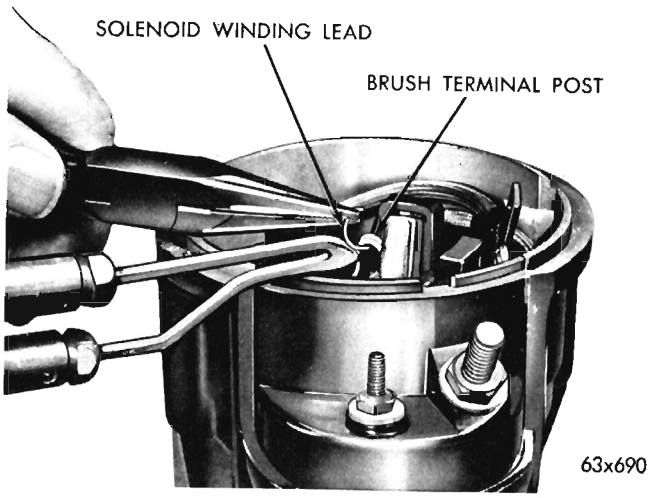


Fig. 5—Unsoldering the Solenoid Lead

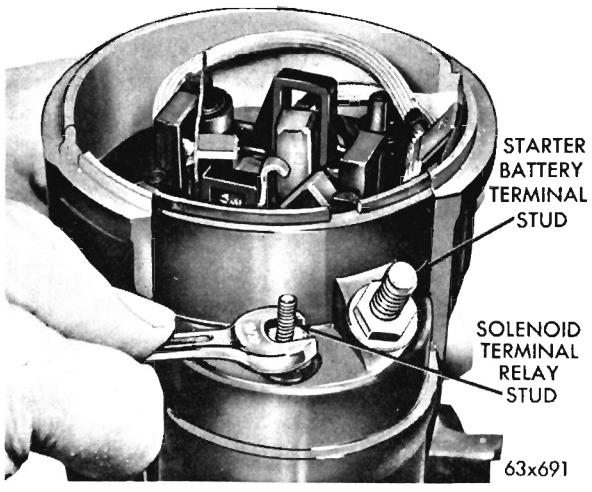


Fig. 6—Removing the Solenoid Terminal Nut

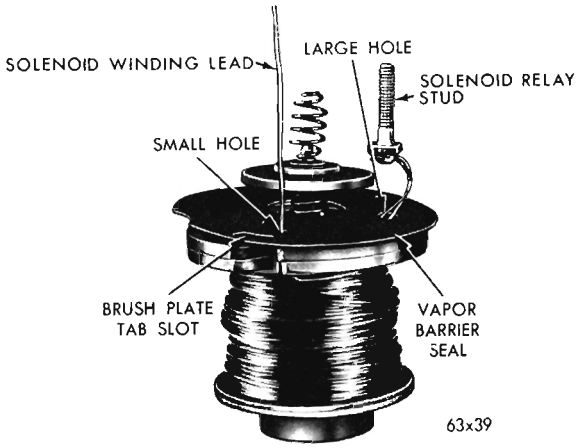


Fig. 7—Solenoid Assembly Removed

(10) Remove nut ($^{11}/_{32}$ wrench), steel washer and insulating washer from the solenoid terminal (Fig. 6).

(11) Straighten the solenoid wire and remove the brush holder plate with brushes as an assembly.

(12) Remove the ground screw from the gear housing.

(13) Remove the solenoid assembly from the gear housing well (Fig. 7).

(14) Remove the nut, steel washer and sealing washer from starter battery terminal.

(15) Remove the starter battery terminal from holder plate.

(16) Remove the solenoid contact and plunger assembly from the solenoid.

(17) Remove the solenoid coil sleeve (Fig. 8).

(18) Remove the solenoid return spring from the well of the solenoid housing movable core.

(19) Remove the solenoid coil retainer washer and solenoid coil retainer from the solenoid housing (Fig. 9).



Fig. 8—Removing the Solenoid Coil Sleeve

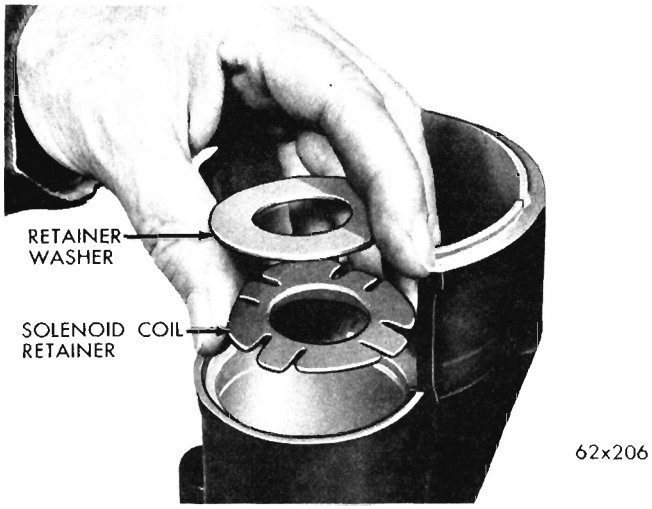


Fig. 9—Identification of the Solenoid Coil Retainer and Retainer Washer

(20) Remove the dust cover from the gear housing (Fig. 10).

(21) Release the snap ring that positions the driven gear on the pinion shaft (Fig. 11).

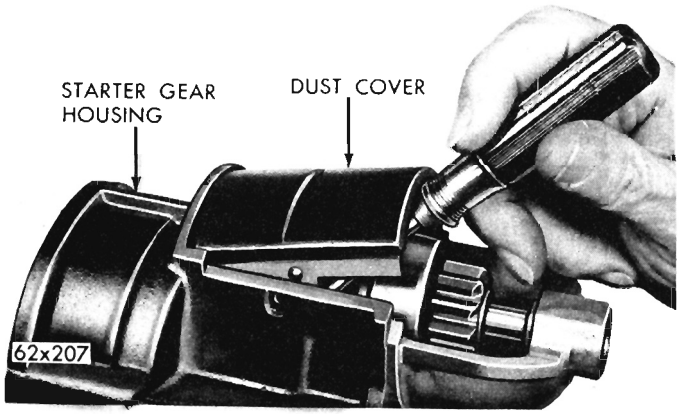


Fig. 10—Removing the Dust Cover

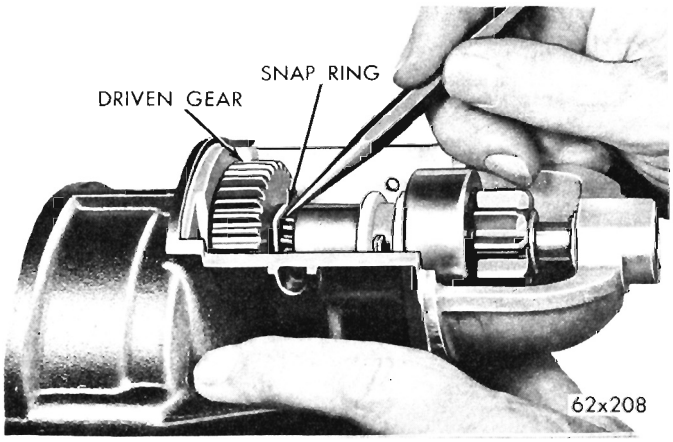


Fig. 11—Removing the Driven Gear Snap Ring

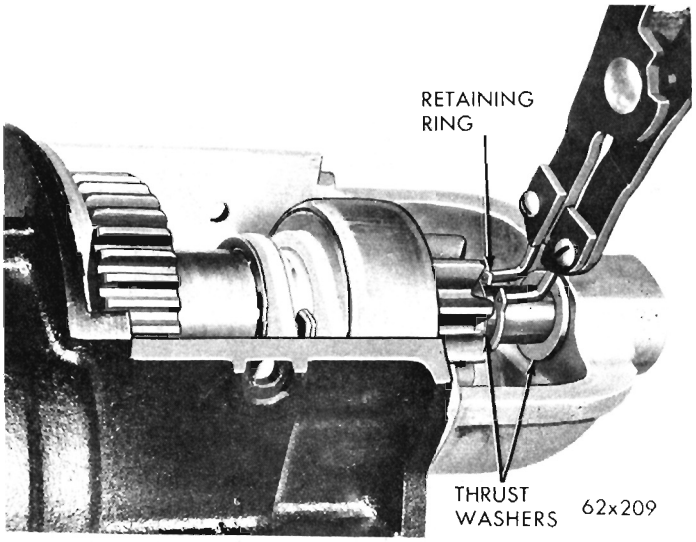


Fig. 12—Removing or Installing the Pinion Shaft Retainer Ring

CAUTION: The ring is under tension and a cloth should be placed over the ring to prevent the ring from springing away after removal.

(22) Release the retainer ring at the front of the pinion shaft (Fig. 12).

NOTE: Do not spread the retainer ring any greater than the outside diameter of the pinion shaft otherwise the lock ring can be damaged.

(23) Push the pinion shaft towards the rear of the housing (Fig. 13) and remove the snap ring and thrust washers, clutch and pinion assembly, with the two shifter fork nylon actuators (Fig. 14).

(24) Remove the driven gear and friction washer.

(25) Pull the shifting fork forward and remove the solenoid moving core (Fig. 15).

(26) Remove the shifting fork retainer pin (Fig. 16) and remove the clutch shifting fork assembly.

NOTE: The gear housing is serviced with the

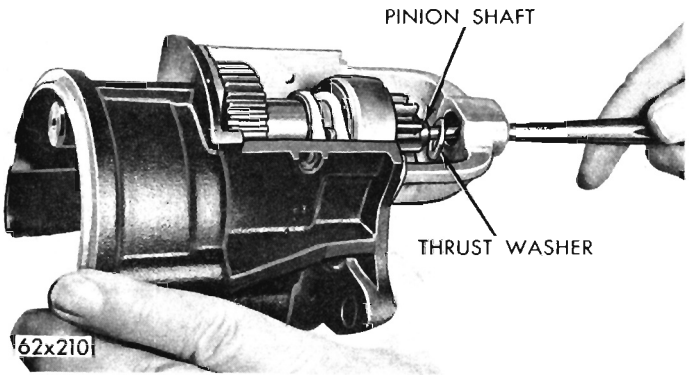


Fig. 13—Removing the Pinion Shaft

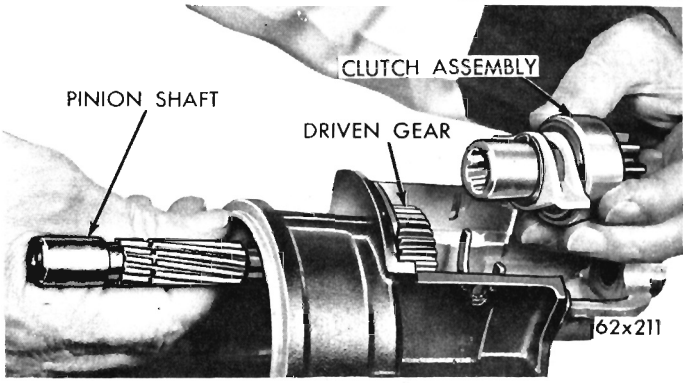


Fig. 14—Removing or Installing the Clutch Assembly

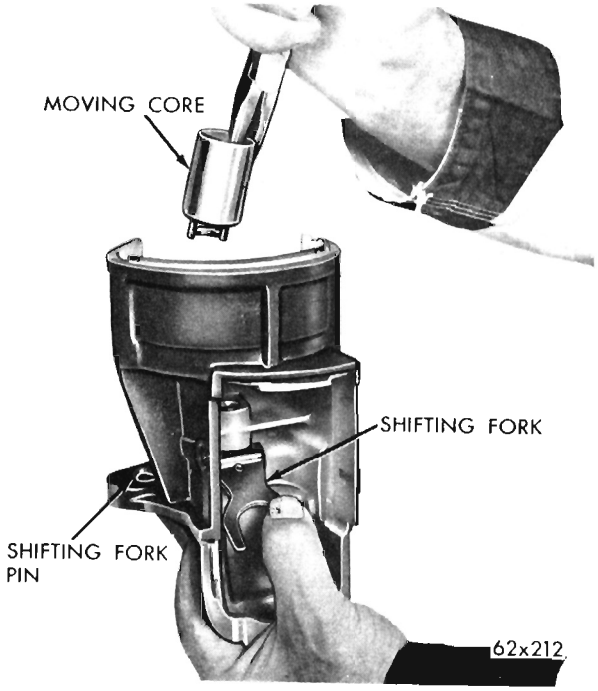


Fig. 15—Removing or Installing the Movable Core

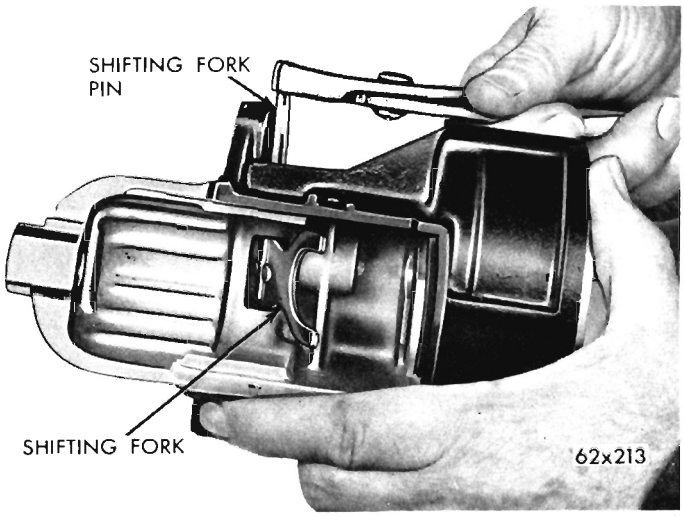


Fig. 16—Removing or Installing the Shifting Fork Pin

pinion shaft and armature shaft bushings as an assembly. Bushings can be replaced with Tool C-3944.

Cleaning and Inspection

(1) Do not immerse the parts in cleaning solvent. Immersing the field frame and coil assembly and/or armature will damage the insulation. Wipe these parts with a clean cloth **only.**

(2) Do not immerse the clutch unit in cleaning solvent. The clutch is pre-lubricated at the factory and solvent will wash the lubrication from the clutch.

(3) The starter clutch outer housing and pinion gear may be cleaned with a cloth moistened with cleaning solvent and wiped dry with a clean dry cloth.

(4) Unsolder the solenoid lead wires from the solenoid terminal relay stud.

(5) Clean all corrosion from the solenoid assembly (washers, sleeve and retainer and inside of the solenoid housing). These metal parts are part of the solenoid hold-in coil ground circuit and they must be clean.

(6) Clean the terminal contacts and contactor with crocus cloth.

(7) Thoroughly clean the outside area of the brush plate to remove all oil and dirt.

5. REPLACEMENT OF BRUSHES AND SPRINGS

(1) Brushes that are worn more than ½ the length of the brushes, or are oil-soaked, should be replaced.

(2) When resoldering the shunt field and solenoid lead, make a strong, low resistance connection using a high temperature solder and resin flux. **Do not use acid or acid core solder. Do not** break the shunt field wire when removing and installing the brushes.

(3) Measure the brush spring tension with a spring scale hooked under the spring near the end. Pull the scale on a line parallel to the edge of the brush and take a reading just as the spring end leaves the brush. The spring tension should be 32 to 48 ounces. Replace the springs that do not meet specifications.

6. TESTING THE ARMATURE

Testing the Armature for Short Circuit

Place the armature in the growler and hold a thin steel blade parallel to the core and just above it, while slowly rotating the armature in the growler. A shorted armature will cause the blade to vibrate and be attracted to the core. Replace any armature that is shorted.

Contact the armature shaft and each of the commutator riser bars with a pair of test lamp test prods. If the lamp lights, it indicates a grounded armature. Replace any grounded armature.

Testing Commutator Runout, Refacing and Undercutting

Place the armature in pair of "V" blocks and measure the runout with a dial indicator; measure both the shaft and the commutator. A bent shaft requires replacement of the armature. When the commutator runout exceeds .003 inch, the commutator should be refaced and undercut using Tool C-770. Remove only sufficient metal to provide a smooth, even surface.

Testing Field Coils for Ground

(1) Remove the field frame assembly from the starter.

(2) Carefully drill out the rivet that attaches the series field coil (ground) lead and shunt field coil lead to the field frame.

(3) Insulate the field coil leads from the field frame.

(4) Test for ground using a 110 volt test lamp.

On shunt type starters (3 coils in series, one shunt), touch one prod of the test lamp to the series field coil lead, other test prod to the starter field frame. The lamp should not light. Repeat the same procedure for the shunt field coil. On the 4 coils in series starters, touch one prod of the test lamp to the series field coil lead, other test prod to the starter field frame.

If the lamp lights, it indicates that the field coils are grounded and require replacement.

7. REPLACING THE FIELD COILS

A pole shoe impact screwdriver Tool C-3475 should be used to remove and install the field coils to prevent damage to the pole shoe screws and for proper tightening. The pole shoes that are loose and not properly seated may cause the armature core to rub the pole shoes. This will decrease starter efficiency and damage the armature core.

NOTE: Make sure the area between the leads and the field frame is clean. Peen a new rivet securely to insure a good electrical contact.

8. SERVICING THE BUSHINGS

Inspect the armature shaft bearing and pinion shaft surfaces and bushings for wear. Try the bushings for wear by placing them on shafts and testing for side play. Replace the commutator end head and bushing assembly if the bushing is worn. Replace the starter gear housing bushings if they are worn. Use Tool C-3944 to correctly position the pre-sized bushings.

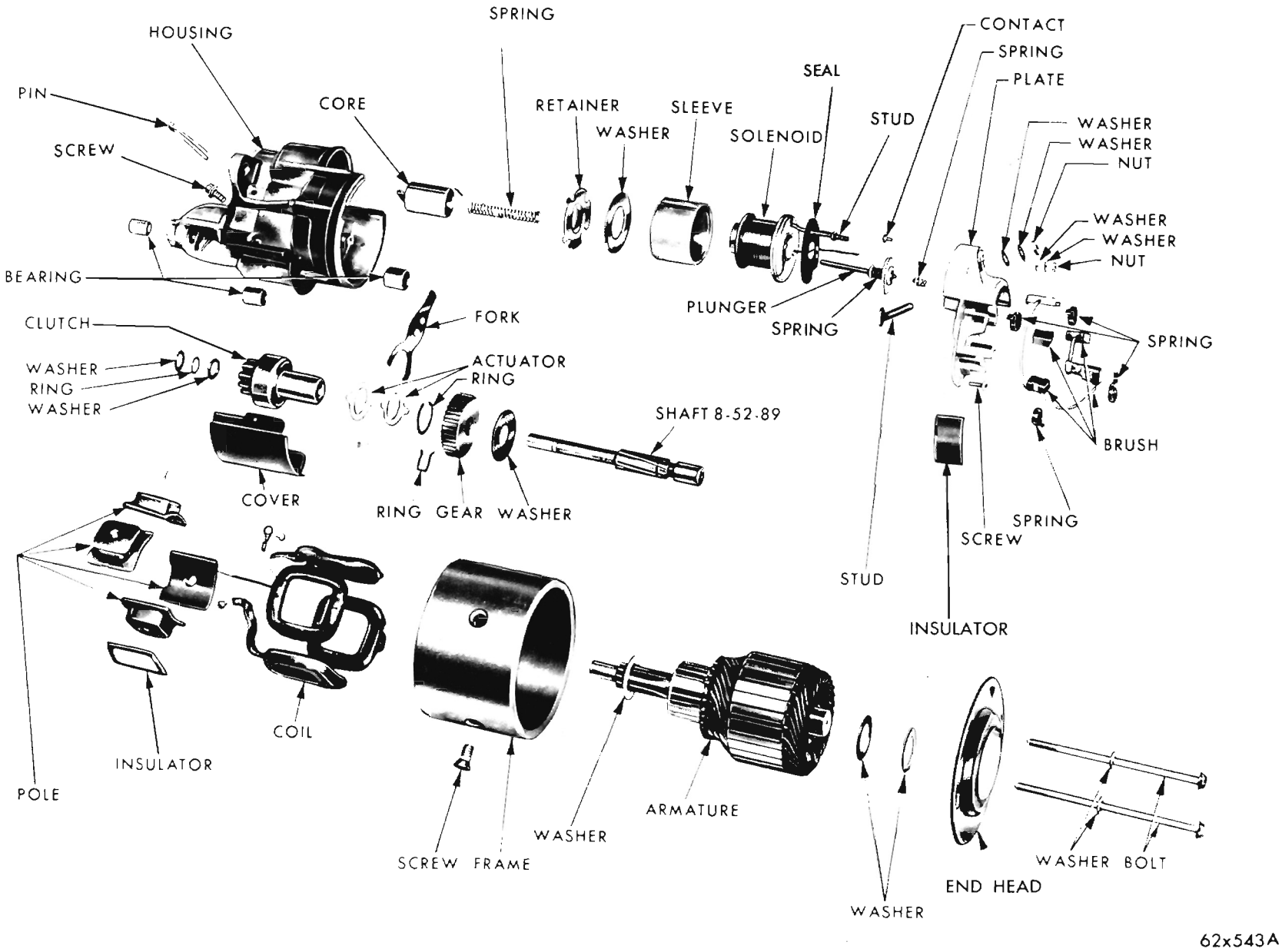


Fig. 17—Starting Motor (Disassembled View)

9. SERVICING THE STARTER CLUTCH UNIT

Do not immerse the starter clutch unit in a cleaning solvent. The starter clutch is pre-lubricated at the factory and the solvent will wash the lubricant from the clutch.

The starter clutch outer housing and pinion gear may be cleaned with a cloth moistened with cleaning solvent and wiped dry with a clean dry cloth.

Rotate the pinion. The pinion gear should rotate smoothly in one direction, but should not rotate in the opposite direction. If the starter clutch unit does not function properly, or the pinion is worn, chipped or burred, replace the starter clutch unit.

Assembly (Fig. 17)

NOTE: The shifter fork consists of two spring steel plates assembled with two rivets (Fig. 18). There should be approximately 1/16 inch side movement, as shown in Figure 18 to insure proper pinion gear engagement. Lubricate between the plates sparingly with SAE 10 engine oil.

(1) Position the shifter fork in the drive housing and install the shifting fork retainer pin (Fig. 16). One tip of pin should be straight, the other tip should be bent at a 15 degree angle away from the housing. Fork and retainer pin should operate freely after bending the tip of pin.

(2) Install the solenoid moving core and engage the shifting fork (Fig. 15).

(3) Enter the pinion shaft into the drive housing, and install the friction washer and driven gear.

(4) Install the clutch and pinion assembly (Fig. 14), thrust washer, retaining ring and the thrust washer.

(5) Complete the installation of the pinion shaft engaging the shifting fork with the clutch actuators. Figure 19 shows the correct relation of the parts at the assembly.

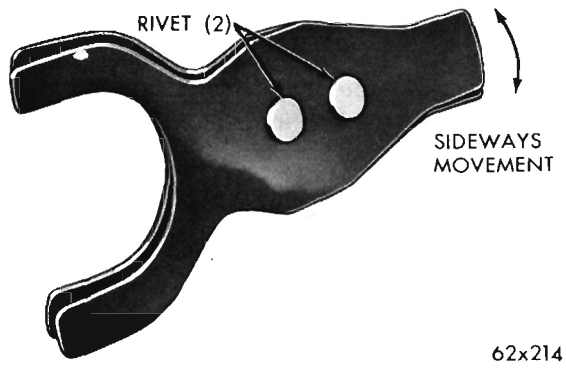


Fig. 18—Shifter Fork Assembly

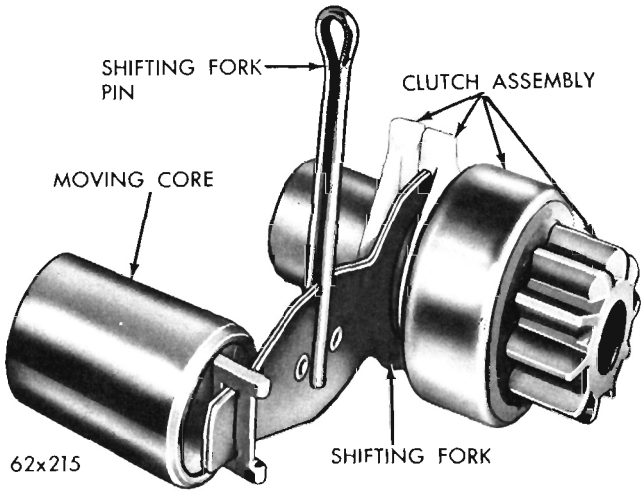


Fig. 19—Shifter Fork and Clutch Arrangement

NOTE: The friction washer must be positioned on the shoulder of the splines of the pinion shaft before the driven gear is positioned.

(6) Install the driven gear snap ring (Fig. 11).

(7) Install the pinion shaft retaining ring (Fig. 12). Make sure the ring fits tightly in the shaft groove.

(8) Bend the four (4) tangs of the coil retainer "up" to a measurement of $\frac{5}{32}$" to $\frac{3}{16}$" above the surface of the retainer (Fig. 20) to insure higher compression and a more positive ground.

(9) Install the solenoid coil retainer (Fig. 9) (with tangs down).

NOTE: Space the retainer in the housing bore so that the four tangs rest on the ridge in the housing bore and not in the recesses.

(10) Install the solenoid coil retainer washer.

(11) Install the starter solenoid return spring into the bore of the movable core.

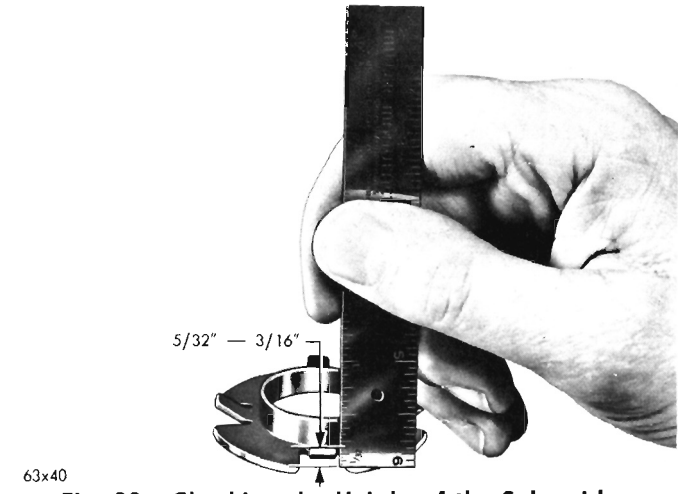


Fig. 20—Checking the Height of the Solenoid Coil Retainer Tangs

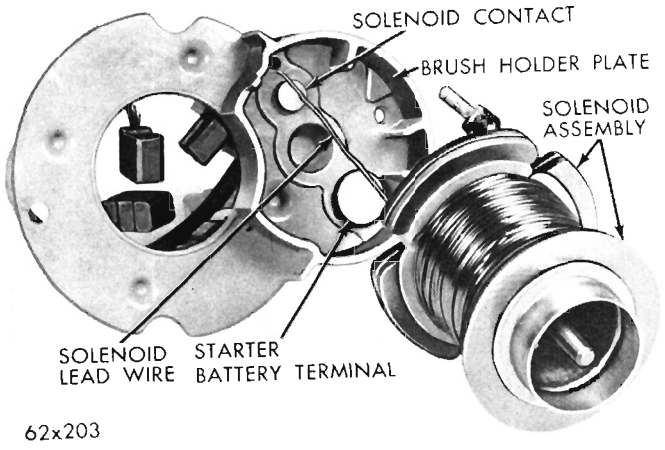


Fig. 21—Assembling the Solenoid to the Brush Holder Plate

(12) Straighten the solenoid lead wires and install the solenoid contact seal over the wires, inserting the double wires of the terminal stud into the large hole (Fig. 7) and the solenoid winding lead wire into the small hole.

(13) Insert the ends of the terminal stud wires into the groove of the terminal stud, crimp wires in place and solder with resin core solder.

NOTE: Inspect the condition of the starter solenoid switch contacting washer. If the top of washer is burned or arcing, disassemble the contact switch plunger assembly and reverse the washer.

(14) Install the solenoid contact plunger assembly into the solenoid and reform the double wires to allow for proper entry of the terminal stud into the brush holder with the double wires curved around the contactor.

CAUTION: The contactor must not touch the double wires when the solenoid is energized after the assembly is completed (Fig. 7). Make sure the contact spring is positioned on the solenoid contact assembly.

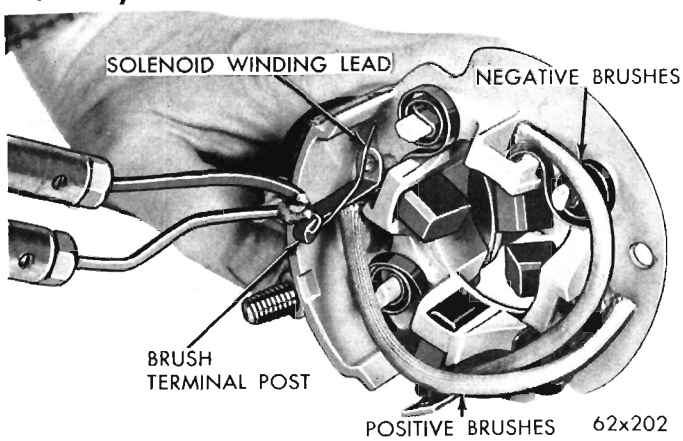


Fig. 22—Soldering the Soleonid Winding Lead



Fig. 23—Installing the Solenoid Coil, Sleeve and Brush Holder

(15) Assemble the battery terminal stud in the brush holder placing the sealing washer under the plain washer.

NOTE: Inspect the condition of the contacts in the brush holder plate. If the contacts are badly burned, replace the brush holder with brushes and contacts as an assembly.

(16) Enter the solenoid lead wire through the hole in brush holder (Fig. 20) and install the solenoid stud, insulating washer, flat washer and nut.

NOTE: Use care when installing the solenoid contact seal over the tab on the brush plate to prevent tearing the seal.

(17) Solder the solenoid lead wire to the brush terminal post (Fig. 22). Wrap the wire securely around the terminal, and solder securely with a high temperature solder and resin flux.

(18) Carefully enter the solenoid coil and solenoid coil sleeve into the bore of the gear housing and position the brush assembly into the starter gear housing (Fig. 23). Align the tongue of the ground terminal with the notch in the brush holder.

(19) After the brush holder is bottomed in the housing, install the attaching screw (Fig. 4). Tighten the screw 10 to 15 inch pounds. Install the flat insulating washer and hold in place with friction tape.

(20) Position the brushes with Tool C-3855, as shown in Figure 24.

(21) Position the field frame to the exact position

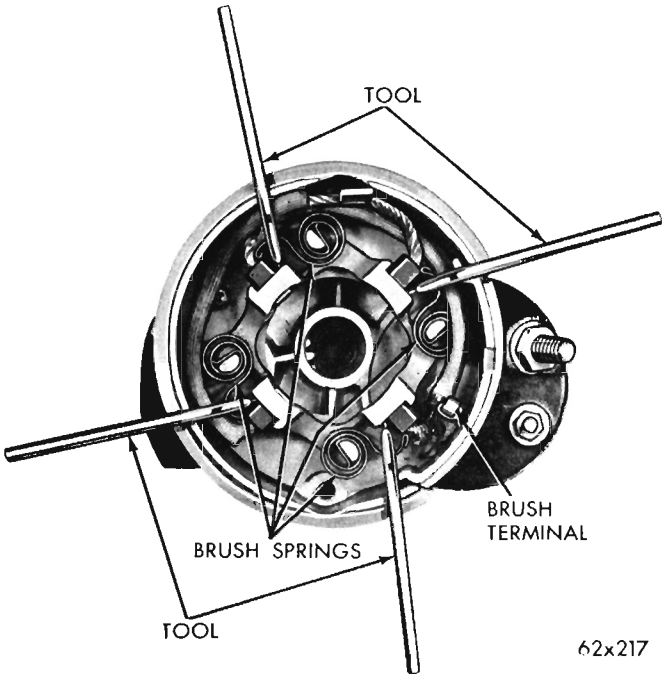


Fig. 24—Positioning the Brushes with Tool Set C-3855

and resolder the field coil lead (Fig. 3).

(22) Install the brush terminal screw (Fig. 2).

(23) Install the armature thrust washer on the brush holder plate (Fig. 1) and enter the armature into the field frame and gear housing (Fig. 25); carefully engaging the splines of the shaft with the reduction gear.

(24) Remove the brush positioning Tool C-3855 (Fig. 26).

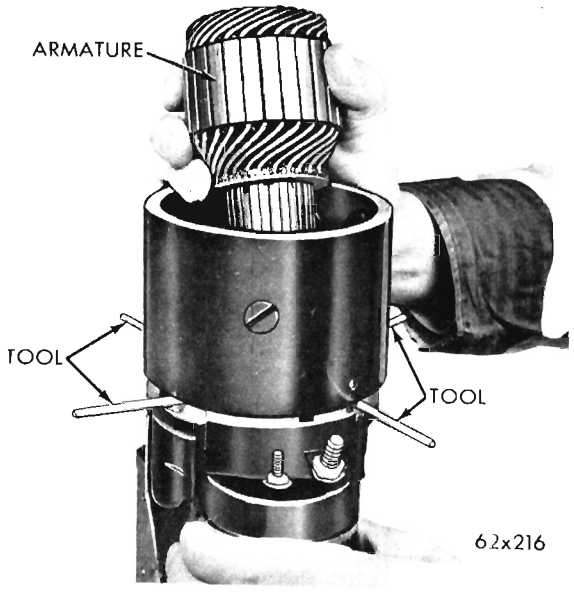


Fig. 25—Installing the Starter Armature

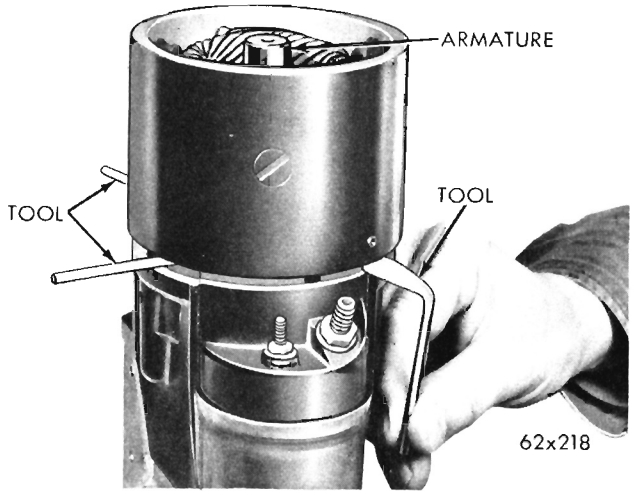


Fig. 26—Removing the Brush Positioning Tools

(25) Install the thrust washer (fibre) and washer (steel) on the armature shaft.

(26) Position the starter end head assembly and install the starter frame screws and lockwashers. Tighten the screws securely.

(27) Install the gear housing dust cover. Make sure the dimples on the cover are securely engaged in the holes provided in the gear housing.

(28) Install ground screw in gear housing. Tighten securely.

(29) Clean the area at joint between the brush holder plate to field frame and gear housing mating joint. Apply a bead of brush plate sealer MoPar 2421847 around the four sides of the joint (Fig. 27).

CAUTION: The sealer must be flowed continuously to avoid gaps. After bead has been flowed on, use a brush or a small paddle moistened in mineral spirits to press adhesive into joint. Be sure not to get the adhesive on the battery and/or solenoid terminals.

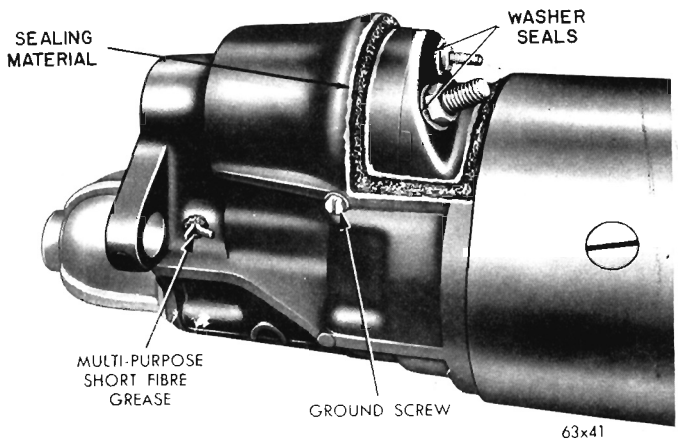


Fig. 27—Sealing the Brush Holder Plate

Installation (On the Engine)

(1) Before installing the starting motor, make sure starter and flywheel housing mounting surfaces are free of dirt and oil to insure a good electrical contact.

(2) Position the starter to the flywheel housing.

(3) Install the starting motor, washer and bolt, oil cooler lines bracket (if so equipped) and washer and nut.

NOTE: When tightening the attaching bolt and nut be sure to hold the starting motor pulled away from the engine to insure proper alignment.

(4) Attach the wire at the solenoid switch terminal and cable to starter terminal.

(5) Connect the battery ground cable and test the operation of the starting motor for proper engine cranking.

SERVICE DIAGNOSIS

STARTING MOTOR

Condition	Possible Cause	Correction
Starter Fails to Operate	(a) Weak battery or dead cell in the battery.	(a) Test for specific gravity and test for dead cell. Replace or recharge the battery as required.
	(b) Ignition switch faulty.	(b) Test and replace the switch if necessary.
	(c) Loose or corroded battery cable terminals.	(c) Clean terminals and clamps, replace if necessary. Apply a light film of vasoline to terminals. Tighten clamps securely.
	(d) Open circuit, wire between the ignition-starter switch and ignition terminal on the starter relay.	(d) Inspect and test all the wiring.
	(e) Inoperative clutch unit.	(e) Replace the clutch unit.
	(f) Faulty starting motor.	(f) Test and repair.
	(g) Armature shaft sheared.	(g) Test and repair.
Starter Fails and Lights Dim	(a) Weak battery or dead cell in the battery.	(a) Test the specific gravity and test for dead cell. Replace or recharge the battery as required.
	(b) Loose or corroded battery cable terminals.	(b) Clean the terminals and clamps, replace if necessary. Apply a light film of vasoline to the terminals. Tighten the clamps securely.
	(c) Internal ground in wiring.	(c) Test and repair the starter.
	(d) Grounded starter fields.	(d) Test and repair the starter.
	(e) Armature rubbing on pole shoes.	(e) Test and repair the starter.
Starter Turns, But Pinion Does Not Engage	(a) Starter clutch slipping.	(a) Replace the clutch unit.
	(b) Broken teeth on flywheel drive gear.	(b) Replace the flywheel ring gear. Also examine teeth on the starter clutch pinion gear.
	(c) Pinion shaft rusted, dirty or dry, due to lack of lubrication.	(c) Clean, test and lubricate.
	(d) Wrong starter pinion clearance.	(d) Repair starter as necessary.

SERVICE DIAGNOSIS—(Continued)

STARTING MOTOR

Condition	Possible Cause	Correction
Starter Relay Does Not Close	(a) Battery discharged.	(a) Recharge or replace the battery.
	(b) Faulty wiring.	(b) Test for open circuit, wire between the starter relay ground terminal post and neutral starter switch (automatic transmission only). Also test for open circuit, wire between ignition-starter switch and ignition terminal and starter relay.
	(c) Neutral starter switch on automatic transmission faulty.	(c) Test and replace the switch if necessary.
	(d) Starter relay faulty.	(d) Test and replace if necessary.
	(e) Ignition-starter switch faulty.	(e) Test and replace switch if necessary.
Relay Operates But Solenoid Does not	(a) Faulty wiring, open circuit wire between the starter-relay and solenoid terminal and solenoid terminal post.	(a) Test for open circuit wire between the starter-relay solenoid terminal and solenoid terminal post.
	(b) Faulty solenoid switch or connections.	(b) Test for loose terminal connections between solenoid and starter field.
	(c) Solenoid switch contacts corroded.	(c) Test and replace the solenoid if necessary.
	(d) Broken lead or loose soldered connection inside solenoid switch cover (brush holder plate).	(d) Test and replace the solenoid if necessary.
Solenoid Plunger Vibrates Back and Forth When Switch is Engaged	(a) Battery low.	(a) Test for specific gravity of the battery. Replace or recharge the battery.
	(b) Faulty wiring.	(b) Test for loose connections at relay, ignition-starter switch and solenoid. Repair as necessary.
	(c) Lead or connections broken inside solenoid switch cover (brush holder Plate) or open hold in winding.	(c) Test and replace the solenoid if necessary.
	(d) Check for corrosion on solenoid contacts.	(d) Test and clean the contacts.
Starter Operates But Will Not Disengage When Ignition Starter is Released	(a) Broken solenoid plunger spring or spring out of position.	(a) Test and repair.
	(b) Faulty ignition-starter switch.	(b) Test and replace the switch if necessary.
	(c) Solenoid contact switch plunger stuck in solenoid.	(c) Remove the contact switch plunger, wipe clean of all dirt, place a film of SAE 10 oil on the plunger, wipe off excess.
	(d) Insufficient clearance between winding leads to solenoid terminal and main contactor in solenoid.	(d) Test and repair.
	(e) Faulty relay.	(e) Test and replace the relay if necessary.

PART 3

ALTERNATOR AND VOLTAGE REGULATOR

1. CONSTRUCTION AND OPERATION

The alternator (Fig. 1) is an A.C. current generator, with six (6) built-in silicon rectifiers, that convert the A.C. current into D.C. current. D.C. current is available at the "output" "BAT" terminal. A voltage regulator (Fig. 2) is used in the field circuit to limit the output voltage.

The main components of the alternator are the rotor, the stator, the rectifiers, the two end shields and the drive pulley (See Fig. 3).

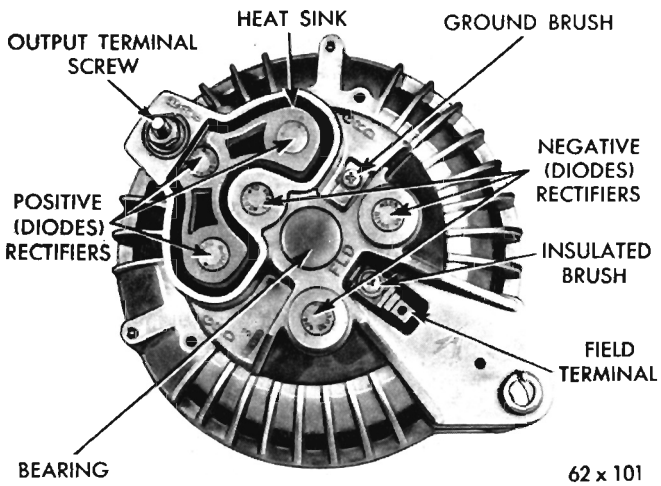


Fig. 1—Alternator Assembly

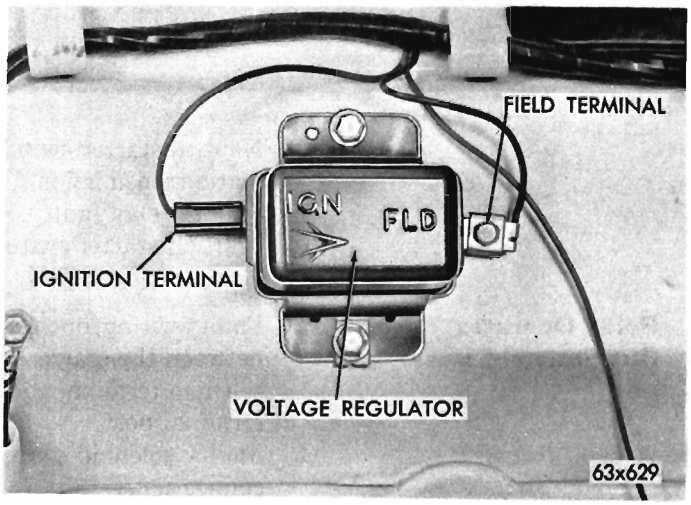


Fig. 2—Voltage Regulator Installed

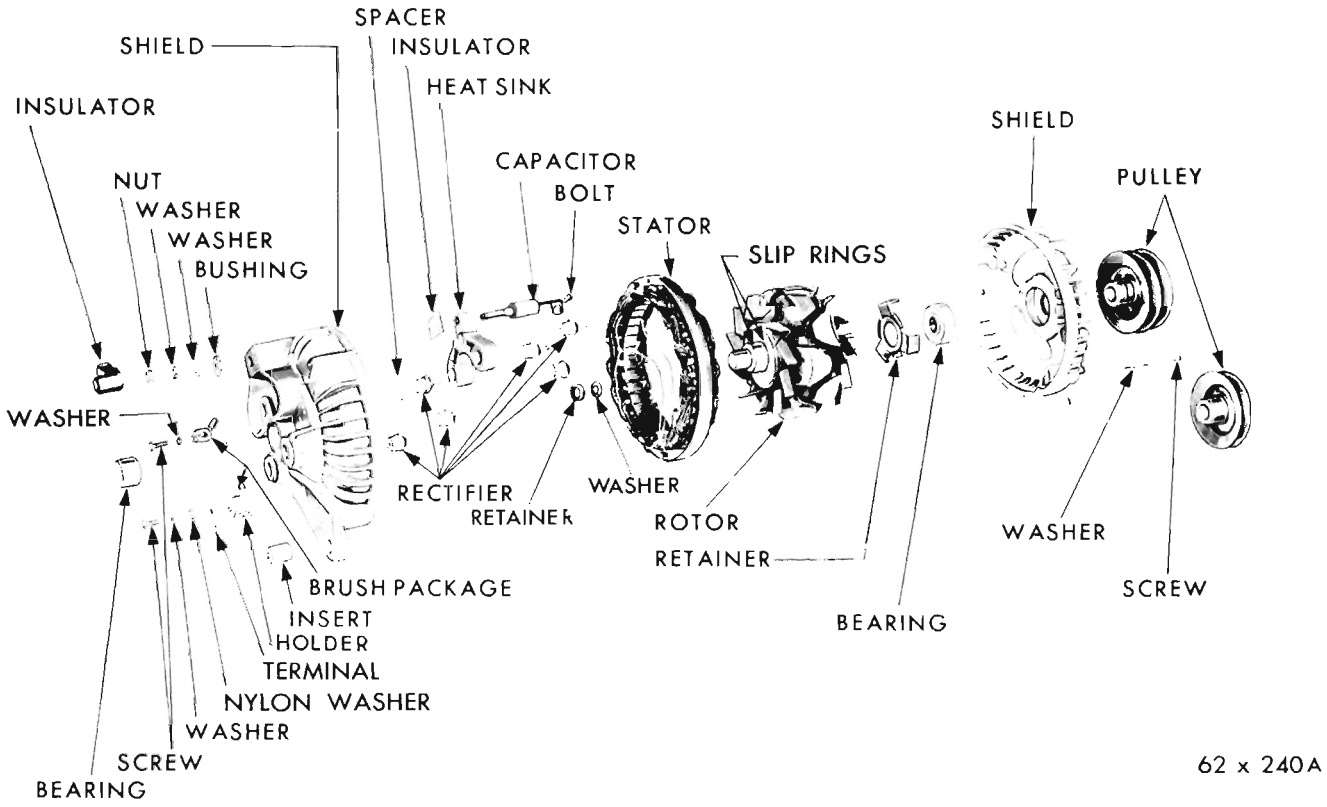


Fig. 3—Alternator (Exploded View)

2. VOLTAGE REGULATOR

The only function of the regulator is to limit the output voltage. The voltage regulator accomplishes this by controlling the flow of current in the rotor field coil, and in effect controls the strength of the rotor magnetic field.

3. TESTING THE ALTERNATOR SYSTEM

(On the Vehicle using the Sun Volt Ampere Tester Model VAT-20C and Sun Battery Post Adapter.

NOTE: For the sake of uniformity, one type of equipment is shown. Follow the instructions of the equipment manufacturers on comparable equipment when making the following tests:

A. Preliminary Checks

(1) **TEST BATTERY CONDITION.** Perform reliable battery tests to determine the condition and state of charge of the battery. If the battery is defective or not fully charged, install a fully charged battery for test purposes.

(2) **TEST ALTERNATOR BELT TENSION AND CONDITION.** Replace the alternator drive belt if necessary and make sure that there is adequate tension on the belt.

(3) **INSPECT CONDITION OF WIRES AND THEIR CONNECTIONS**. Before performing the test on the system, correct any problem with the wiring, such as loose connections, corroded connections, burned wiring harness, etc.

B. Tester Controls and Switches

(1) Set Polarity Switch to the NEGATIVE position.

(2) Set tester control knob to the DIRECT position.

(3) Set voltage switch to the 2 VOLT position.

(4) Set field control to the OPEN position.

C. Tester Lead Connections (Fig. 4)

(1) Disconnect the positive battery cable from the battery post and install the BATTERY POST ADAPTER between the cable and post.

(2) Connect the "BAT" lead of the tester to the stud on the adapter.

(3) Connect the "REG" lead of the tester to the binding post on the adapter.

(4) Connect the "GRD" lead of the tester to a good ground on the vehicle.

(5) Connect the negative lead of the voltmeter to the field terminal of the regulator.

(6) Connect the positive lead of the voltmeter to the battery end of the positive battery cable.

NOTE: The Battery Post Adapter BY-PASS SWITCH must be open for all charging system tests. It is closed only for starting the engine.

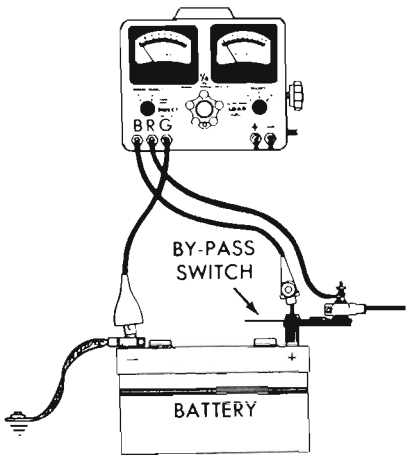
D. Field Circuit Resistance Test (Fig. 5)

(1) Disconnect the slip-on connector from either end of the ignition ballast resistor.

(2) Turn the ignition switch on.

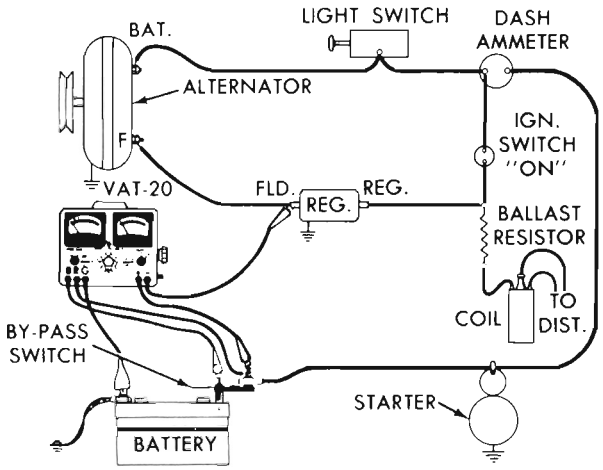
(3) With vehicle doors closed and all accessories turned off, observe the Voltmeter reading. The voltage should not exceed .55 volt. A reading in excess of .55 volt indicates high resistance in the field circuit between the battery and the voltage regulator field terminal.

(4) If high resistance is indicated, move the nega-



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Fig. 4—Tester Lead Connections



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Fig. 5—Field Circuit Resistance and Field Current Drive Test

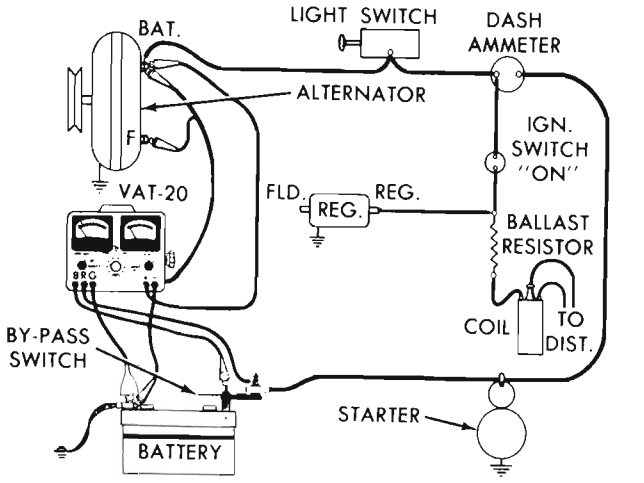


Fig. 6—Current Output Test

tive voltmeter lead to each connection along the circuit towards the battery. A sudden drop in voltage indicates a loose or corroded connection between that point and the last point tested. To test the terminals for tightness, attempt to move the terminal while observing the voltmeter. Any movement of the meter pointer indicates looseness.

NOTE: Excessive resistance in the regulator wiring circuit will cause fluctuation in the ammeter or a below normal charge rate.

E. Field Current Draw Test (Fig. 5)

With tester connections positioned as for the Field Circuit Resistance Test, observe the test ammeter. The test ammeter will indicate the field current draw. Refer to "Specifications".

F. Current Output Test (Fig. 6)

(1) With the ignition switch off, disconnect the field wire from "FLD" terminal of the alternator and at the regulator.

(2) Connect a special jumper from the "FLD" terminal of the alternator to one of the test leads of the tester Field Control.

(3) Connect the other lead of the tester Field Control to the "BAT" terminal of the alternator.

(4) Set the Tester Voltage Switch to the 16 VOLT position.

(5) Connect the positive lead of the test Voltmeter to the "BAT" terminal of the alternator.

(6) Connect the negative lead of the Test Voltmeter to a good ground.

(7) Reconnect the slip-on connector at ignition ballast resistor.

(8) Close the BY-PASS Switch of the Battery Post Adapter.

(9) With the tester Field Control in the OPEN position, start the engine and adjust to 1250 rpm.

(10) Open the BY-PASS Switch of the Battery Post Adapter.

(11) Rotate the tester Control Knob to the LOAD position until the Voltmeter reads 6 volts.

(12) Rotate the tester Field Control to the Direct position and adjust the tester Control Knob until the Voltmeter reads exactly 15 volts.

(13) Observe the ammeter. The ammeter now indicates maximum output of alternator. The current output should be within the limits shown in "Specifications".

NOTE: The current output should be within 5 amperes of the rated output as there is a total of 5 amperes supplied by the alternator that will not appear on the test ammeter. This consists of ½ ampere approximate for the instruments, 1½ amperes for the engine ignition system, and 3 amperes for field current.

If the output is slightly less (5 to 7 amperes) than that specified above, it may be an indication of possible "open" rectifier or other alternator internal problem. If the output is considerable lower than that specified above, it may be an indication of a possible "shorted" rectifier or other alternator internal problem. In either case the alternator should be removed and tested on the bench before disassembly.

(14) Return the tester Field Control to the OPEN position.

(15) Return tester Control Knob to the DIRECT position.

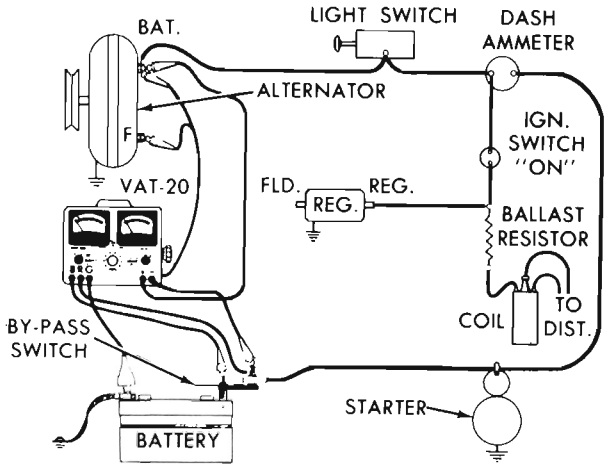


Fig. 7—Insulated Circuit Resistance Test

G. Insulated Circuit Resistance Test (Fig. 7)

(1) Connect the negative lead of Voltmeter to battery end of positive battery cable.

(2) Set Voltage Switch to 2 VOLT position.

(3) Adjust Field Control Unit the tester ammeter reads exactly 10 amperes.

(4) Observe the Voltmeter reading. The voltmeter now indicates the amount of voltage loss across the insulated circuit. The voltage loss should not exceed .3 volt. If a higher voltage loss is indicated, inspect, clean and tighten all the connections in the charging circuit. A voltage loss test may be performed at each connection to locate the connection with excessive resistance.

H. Ground Circuit Resistance Test (Fig. 8)

(1) Connect the positive lead of the test Voltmeter to the negative terminal of battery.

(2) Connect the negative lead of the test Voltmeter to a good ground on the alternator.

(3) With the alternator charging 10 amps, observe the Voltmeter reading. The voltmeter now indicates the amount of voltage loss across the ground circuit. The voltage loss should not exceed .3 volt.

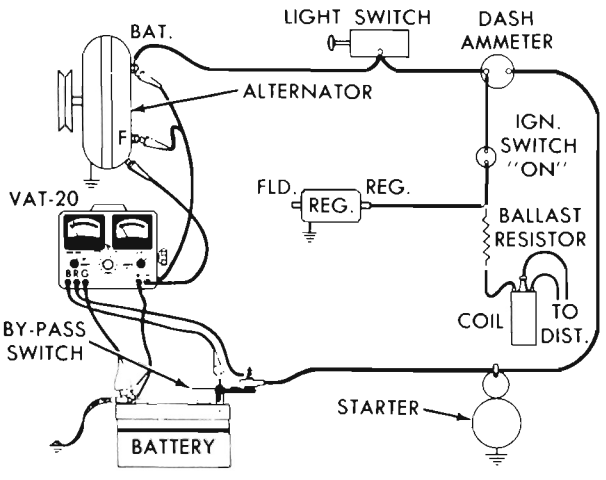
(4) Rotate the tester Field Control to the OPEN position.

I. Voltage Regulator Test (Fig. 9)

NOTE: Regulator temperature should be normalized by operating with a 10 ampere load for 15 minutes just prior to testing.

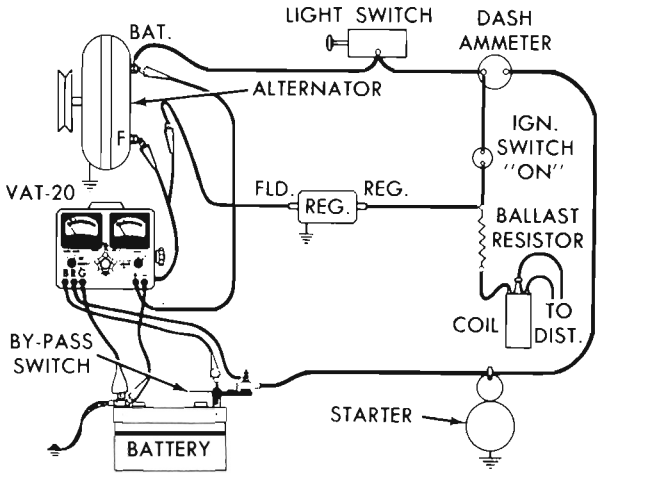
Upper Contacts Test

(1) Remove test lead of tester Field Control from the "BAT" terminal of alternator and connect to the disconnected field wire from regulator.



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Fig. 8—Ground Circuit Resistance Test



64 x 477

Fig. 9—Voltage Regulator Test

(2) Set Voltage Switch to 16 VOLT position.

(3) Connect positive lead of Voltmeter to "BAT" terminal of alternator.

(4) Rotate tester Field Control to DIRECT position.

(5) With the engine operating at 1250 rpm, rotate the tester Control Knob clockwise until the Ammeter reads exactly 15 amperes.

(6) Rotate the tester Field Control from the DIRECT position to the OPEN position and then back to the DIRECT Position to cycle the system.

(7) Observe the test Voltmeter. The voltmeter now indicates the setting of the voltage regulator upper contacts. Refer to "Specifications".

(8) Rotate the tester Control Knob to DIRECT position. If the regulator operates within specifications, proceed to the lower contact voltage test. If the upper contact voltage setting is not within specifications, remove the regulator cover and adjust the voltage setting as outlined in "Regulator Adjustments" test number (1).

Lower Contact Test

(1) Increase the engine speed to 2200 rpm.

(2) Rotate the tester Control Knob to the ¼ OHM position only if the tester Ammeter reads over 5 amperes.

(3) Rotate tester Field Control from DIRECT position to the OPEN position and then back to the DIRECT position to cycle the system.

(4) Observe Voltmeter. The voltmeter now indi-

cates setting of voltage regulator lower contacts. Refer to "Specifications".

Voltage should increase not less than .2 volt or more than .7 volt above the previous operating voltage setting recorded in the upper contact set. A voltage reading of less than .2 volt or more than .7 volt is an indication of a possible wrong air gap setting, refer to "Regulator Mechanical Adjustments".

(5) Rotate tester Field Control to OPEN position and Control Knob to DIRECT position.

Upon completion of the test, reduce engine speed to idle, stop engine, and disconnect all test leads and adaptors. Be sure that all vehicle's cables and wiring connections are secure before restarting engine.

CAUTION: Be sure the negative post of the battery is always connected to ground. Incorrect battery polarity may result in wiring harness damage and may damage the alternator rectifiers. Do not ground the alternator field circuit, as this may damage the regulator.

Adjusting the Voltage Setting to Driving Conditions

The specifications called for in the voltage regulator chart indicate a tolerance of .6 volt from the low setting to the high setting at the temperatures indicated.

To maintain the battery in a full state of charge, the voltage regulator should be adjusted to provide the proper voltage limiting setting according to the customer's driving and load requirement habits as follows:

(1) Test the entire charging system and battery as outlined in this Service Manual.

(2) If there are no defects in the charging system or in the battery and the battery was found to be in a low state of charge, increase the setting by .3 volt (do not exceed specified voltage limits) and retest for an improved battery condition after a reasonable service period (week or two). If the battery state of charge has increased to a satisfactory level, do not change the voltage setting. If the battery shows evidence of over-charge — (low electrolyte level, high water consumption, excessive dampness on top of battery), decrease the setting by .3 volt and retest for an improved battery condition after a reasonable service period (week or two).

CAUTION: Always adjust the settings in steps not to exceed .3 volt at a time (Do not exceed specified voltage limits.)

(3) The proper setting of the voltage regulator is attained when the battery remains at least 1.225 specific gravity in the winter or 1.245 specified gravity in the summer, with a minimum water requirement (not more than an ounce of water per cell per one thousand miles).

Regulator Mechanical Adjustments

Step (1) — Adjust the upper contact voltage setting as necessary by bending the regulator lower spring hanger **down** to **increase** voltage setting, **up** to **decrease** voltage setting. Use an insulated **tool** to bend the spring hanger (Fig. 10). The regulator must be installed, correctly connected, and retested after each adjustment of the lower spring hanger.

NOTE: If repeated readjustment is required, it is permissible to use a jumper wire to ground the regulator base to the fender splash shield for testing, in lieu of reinstalling the regulator each time. However, it is important that the regulator cover be reinstalled, the regulator connections correctly connected, and the regulator satisfactorily insulated by the fender cover to prevent grounding the regulator terminals or resistances. When testing, the regulator must be at the same attitude (or angle) as when installed on the vehicle. If step (1) under "Mechanical Adjustments" does not bring the voltage regulator within specifications, proceed to Step (2) following:

Step (2) — Measure the lower contact point gap. The lower contact gap should be .014 inch plus or minus .002 inch. Adjust the lower contact gap as necessary by bending the lower stationary contact bracket making sure contacts are in alignment.

If the lower contact gap is correct and the voltage regulator setting is still outside the .2 to .7 volt increase, adjust the air gap as follows:

(a) Connect a small dry cell test lamp in series with the "IGN" and "FLD" terminal of the voltage regulator.

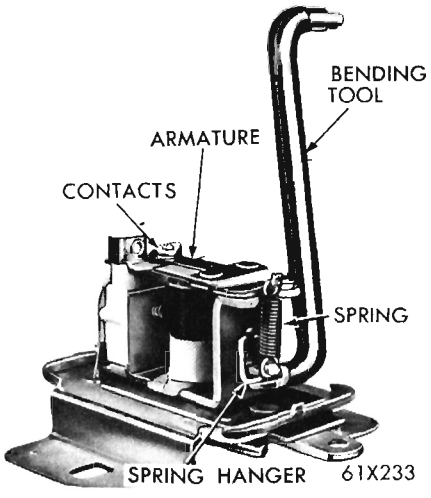


Fig. 10—Adjusting Spring Tension

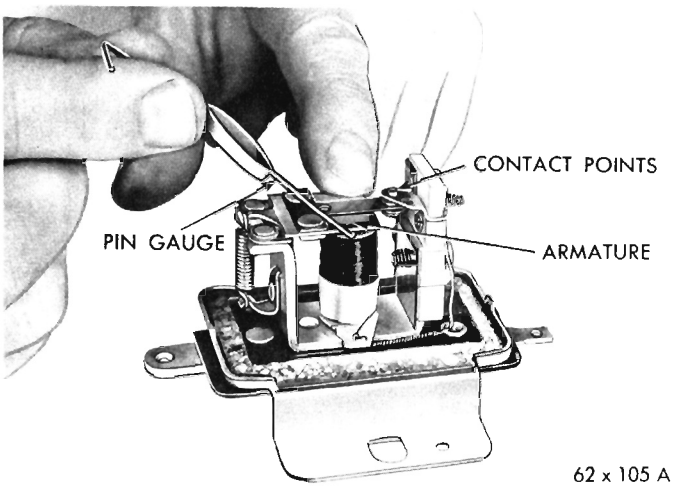


Fig. 11—Checking Air Gap

(b) Insert an .048 inch wire gauge between the regulator armature and the core of the voltage coil next to the stop pin on the armature (Fig. 11).

(c) Press down on the armature (not on the contact reed) until the armature contacts the wire gauge. The upper contacts should just **open** and the test lamp should be **dim.**

(d) Insert an .052 inch wire gauge between the armature and the voltage coil core next to the stop pin on the armature.

(e) Press down on the armature until it contacts the wire gauge. The upper contacts should remain **closed** and test lamp should remain **bright.**

If an adjustment is required to obtain the difference between the upper contact voltage and the lower contact voltage of .2 volt to .7 volt; adjust the air gap by loosening the stationary contact bracket screw and moving the bracket up or down as necessary to obtain the proper air gap setting as follows:

If the difference is above .7 volt, reduce the air gap to a minimum of .045 inch with the contacts open and the test lamp dim. At .048 inch the contacts should close and the test lamp should be bright.

If the difference is below .2 volt, increase the air gap to a maximum of .055 inch with the contacts closed and test lamp bright. At .052 inch contacts should be open and test lamp should be dim.

NOTE: Make sure the air gap is tested with the stationary contact bracket attaching screw fully tightened.

Voltage Regulator Fusible Wire Replacement

(1) Cut the fuse wire above the solder connection at the base and unwind the wire at the top bracket.

CAUTION: If an attempt is made to unsolder the old fuse, the very small wire from the voltage coil may be damaged.

(2) Tin the end of the fuse wire part number 2275242. **Use resin core solder only.**

(3) Holding the tinned end of the new fuse wire into the recessed rivet at the base of the regulator and against the old piece of fuse wire that remains, cause a drop of solder from a soldering iron to fall on these parts. Allow the solder to cool sufficiently for fuse wires to make a good solder joint.

(4) Pull the new fuse wire up enough to remove the slack and wrap it around the bracket. Solder the coiled wire to the bracket and cut off surplus fuse wire.

NOTE: The original fuse wire is machine wound on the upper bracket. The replacement fuse should be soldered to the bracket to ensure a good electrical contact.

(5) Install the regulator cover. Install the regulator. The electrical adjustment must be performed on the vehicle after installation of the regulator.

4. ALTERNATOR

Removal

If the alternator performance does not meet current output specification limits, it will have to be removed and disassembled for further test and servicing.

(1) Disconnect the battery ground cable.

(2) Disconnect the alternator output "BATT" and field "FLD" leads and disconnect the ground wire.

(3) Remove the alternator from the vehicle.

5. BENCH TESTS

Field Coil Draw

If the alternator field coil draw has not been tested on the vehicle, it may be tested on the test bench as follows:

(1) Connect the test ammeter positive lead to the battery positive terminal of a fully charged battery. Connect the test ammeter negative lead to the field terminal of the alternator. Connect a jumper wire to the negative terminal of the battery, and ground it to the alternator end shield.

(2) Slowly rotate the alternator rotor by hand. Observe the ammeter reading. The field coil draw should be 2.3 amperes to 2.7 amperes at 12 volts.

NOTE: A low rotor coil draw is an indication of high resistance in the field coil circuit (brushes, slip

rings, or rotor coil). A higher rotor coil draw indicates a possible shorted rotor coil or a grounded rotor.

Testing Alternator Internal Field Circuit for Ground

(1) To test the internal field circuit for a ground, remove the ground brush. Touch one test prod from a 110 volt test lamp to the alternator insulated brush terminal and the remaining test prod to the end shield. If the rotor assembly or insulated brush is not grounded, the lamp will not light.

(2) If the lamp lights, remove the insulated brush assembly (noting how the parts are assembled) and separate the end shields by removing the three through bolts.

(3) Again test by placing one of the test prods to a slip ring and the remaining test prod to the end shield. If the lamp lights, the rotor assembly is grounded and requires replacement. If the lamp does not light after removing the insulated brush and separating the end shields, the insulated brush is grounded.

(4) Examine the plastic insulator and the screw. **The screw is a special size and must not be substituted by another size.**

(5) Install the insulated brush holder, terminal, insulated washer, shake proof washer and screw. If the parts were not assembled in this order or if the wrong screw was used this could be the cause of the ground condition.

Disassembly

To prevent possible damage to the brush assemblies, they should be removed before proceeding with the disassembly of the alternator. The insulated brush is mounted in a plastic holder that positions the brush vertically against one of the slip rings.

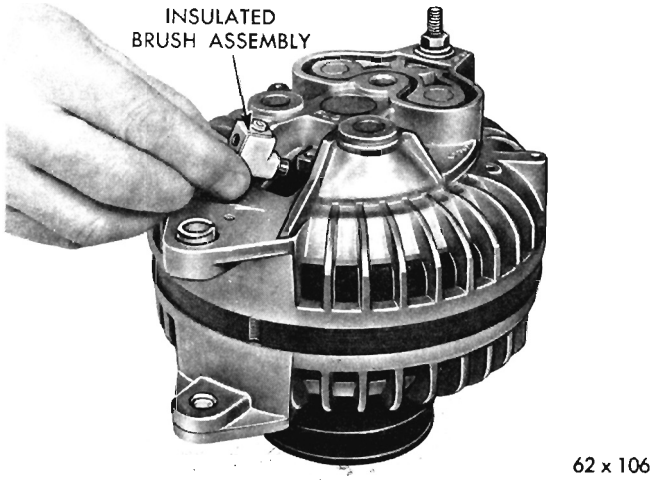


Fig. 12—Removing or Installing the Insulated Brush

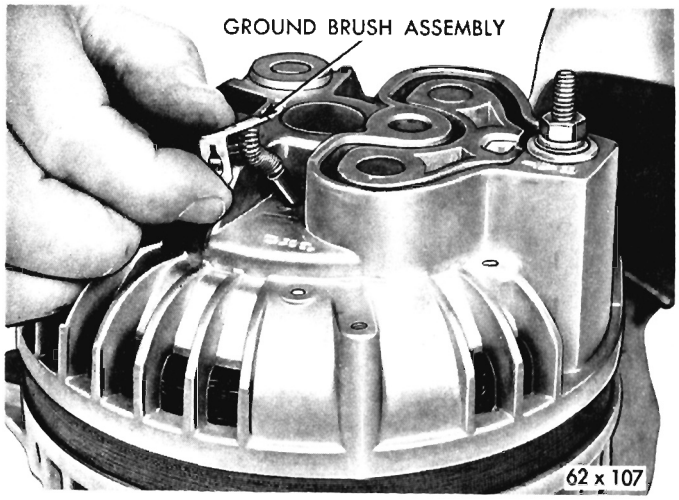


Fig. 13—Removing or Installing the Ground Brush

(1) Remove the retaining screw lockwasher, insulated washer, and field terminal, and carefully lift the plastic holder containing the spring and brush assembly from the end housing (Fig. 12).

(2) The ground brush is positioned horizontally against the remaining slip ring and is retained in a holder that is integral with the end shield. Remove the retaining screw and lift the clip, spring and brush assembly from the end shield (Fig. 13).

CAUTION: The stator is laminated, do not burr the stator or the end shield.

(3) Remove the through bolts and pry between the stator and drive end shield with the blade of a screwdriver (Fig. 14). Carefully separate the drive end shield, pulley and rotor assembly away from the stator and the rectifier shield assembly.

(4) The pulley is an interference fit on the rotor shaft. Remove the pulley with puller Tool C-3615 or C-3934 and special adaptor SP-3002 (Fig. 15).

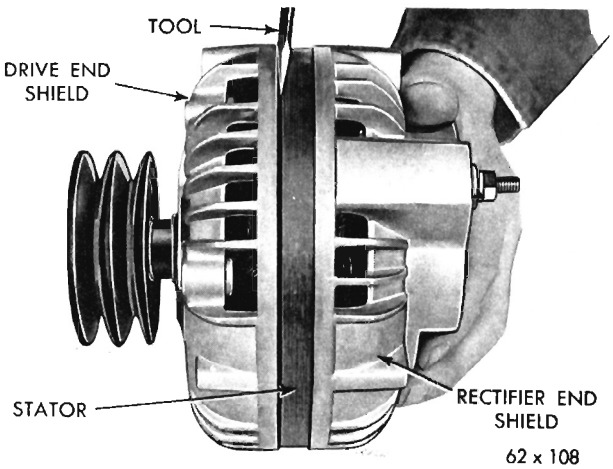


Fig. 14—Separating the Drive End Shield from the Stator

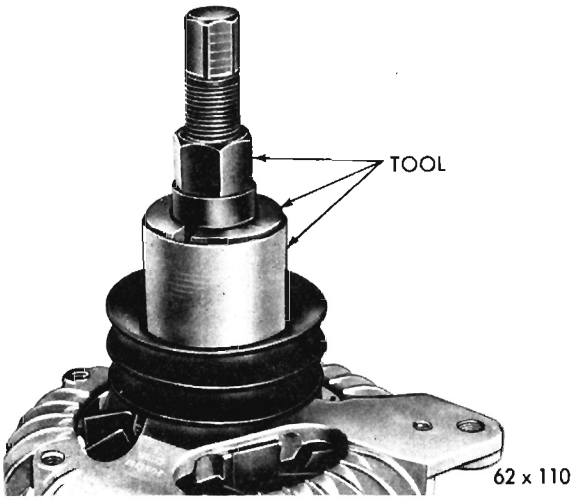


Fig. 15—Removing the Alternator Pulley

(5) Pry the drive end bearing spring retainer from the end shield with a screwdriver (Fig. 16).

(6) Support the end shield and tap the rotor shaft with a plastic hammer to separate the rotor from the end shield.

NOTE: The new bearing is lubricated with a predetermined amount of special lubricant and does not require additional lubrication.

(7) The drive end ball bearing is an interference fit with the rotor shaft. Remove the bearing with puller Tool C-3615 or C-3934 and adapter as follows:

(a) Position the center screw of Tool C-3615 or C-3934 on the rotor shaft.

(b) Place the thin lower end of the adapters SP-3375 under the bearing equally spaced and the upper end of the adapters around the center screw.

(c) Hold the adapters and center screw in position with the tool sleeve.

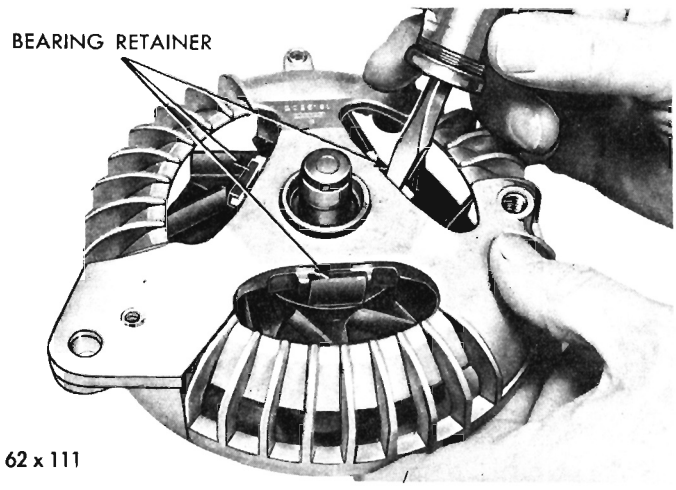


Fig. 16—Disengaging the Bearing Retainer from the End Shield

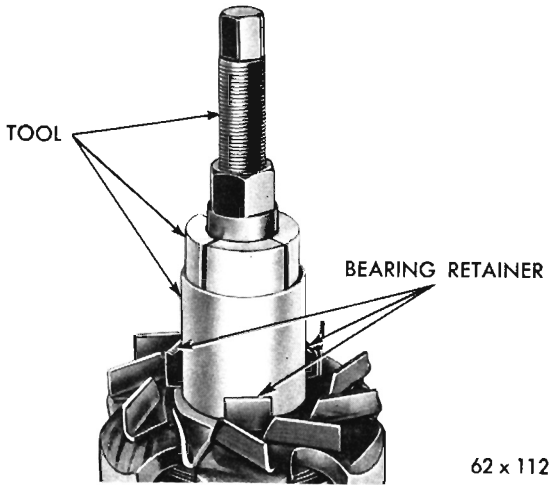


Fig. 17—Removing the Bearing from the Rotor Shaft

CAUTION: The tool sleeve must bottom on the bearing, otherwise, the adapters may be damaged.

(d) Turning the center screw while holding the outer body of tool (Fig. 17) will withdraw the bearing from the rotor shaft.

(8) Remove the D.C. output terminal nuts and washers and remove the terminal screw and inside capacitor.

NOTE: The heat sink is also held in place by the terminal screw.

(9) Remove the insulator (Fig. 18).

(10) The needle roller bearing in the rectifier end shield is a press fit. If it is necessary to remove the rectifier end frame needle bearing, protect the end shield by supporting the shield with Tool SP-3383 when pressing the bearing out with Tool C-3770A (Fig. 19).

NOTE: The new bearing is prelubricated and no

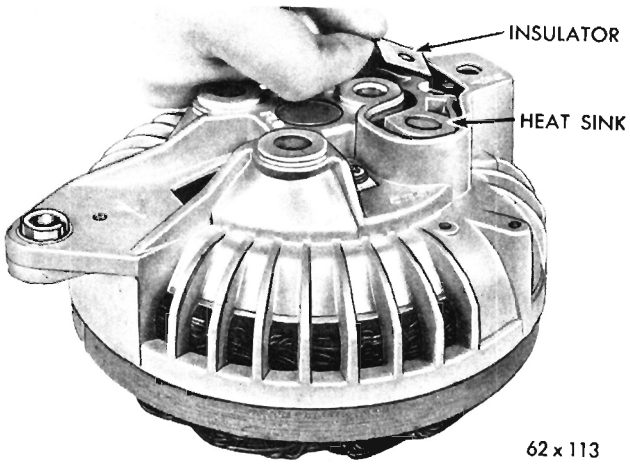


Fig. 18—Removing or Installing the Heat Sink Insulator

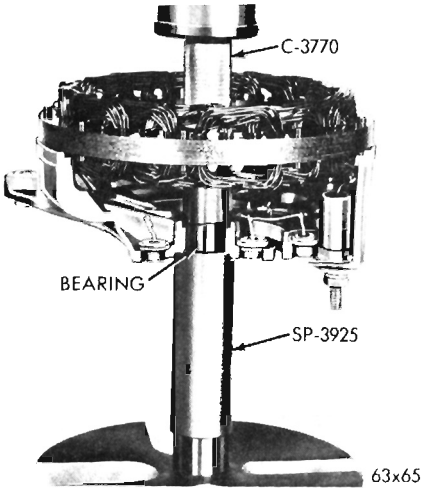


Fig. 19—Removing the Rectifier End Shield Bearing

additional lubricant should be added, as an excessive amount of lubricant will contaminate the slip rings and cause premature brush and rotor failures.

6. TESTING THE RECTIFIERS WITH TOOL C-3829

Rectifier Tester Tool C-3829 provides a quick, simple and accurate method to test the alternator rectifiers without the necessity of disconnecting the soldered rectifier leads. With the alternator rectifier and end shield separated from the drive end housing proceed with rectifier tests as follows:

Positive Case Rectifier Test (Fig. 20)

(a) Place the alternator on an insulated surface. Connect the test lead clip to the alternator ("BAT") output terminal.

(b) Plug in the Tool C-3829 power source lead into a 110 volt A.C. power supply. Touch the exposed metal connections of each of the positive case rectifiers with the test prod.

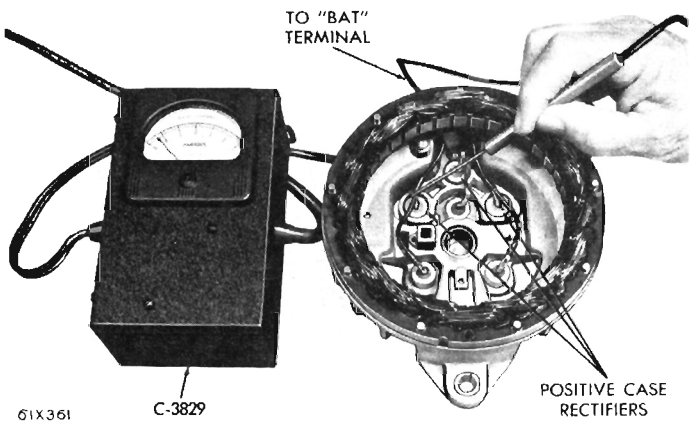


Fig. 20—Testing the Positive Rectifiers (Typical)

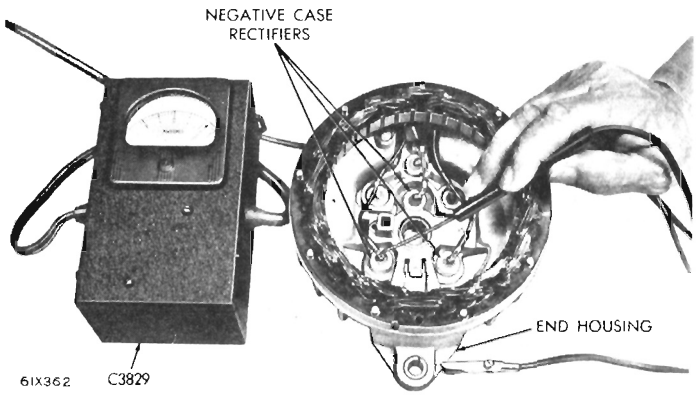


Fig. 21—Testing the Negative Rectifiers (Typical)

CAUTION: Do not break the sealing around the rectifier lead wire. The sealing material is for protection against corrosion. Always touch the test prod to the exposed metal connection nearest the rectifier.

The reading for satisfactory rectifiers will be 1¾ amperes or more. The reading should be approximately the same for the three rectifiers.

When two rectifiers are good and one is shorted, the reading taken at the good rectifiers will be low, and the reading at the shorted rectifiers will be zero. Disconnect the lead to the rectifier reading zero and retest. The reading of the good rectifiers will now be within the satisfactory range.

Negative Case Rectifier Test (Fig. 21)

(a) Connect the test lead clip to the rectifier end housing.

(b) Touch the exposed connection of each of the negative case rectifiers with the test prod.

The test specifications are the same, and the test results will be approximately the same as for the

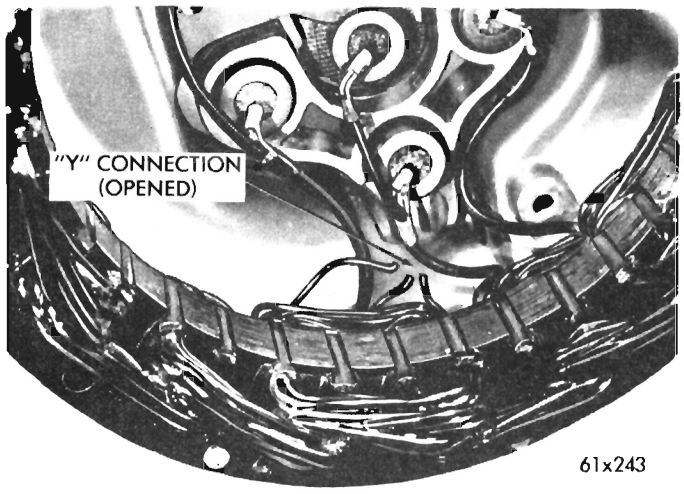


Fig. 22—Separating the Three Stator Leads (Typical)

positive case rectifiers, except the meter will read on the opposite side of the scale.

7. TESTING THE RECTIFIERS AND STATOR (Without Tool C-3829)

(a) Separate the three (3) stator leads at the "Y" connection (See Fig. 22).

NOTE: Cut the stator connections as close to the connector as possible because they will have to be soldered together again. If they are cut too short it may be difficult to get them together again for soldering.

(b) Test the rectifiers with a 12 volt battery and a test lamp equipped with a number 67 bulb (4 candle power) by connecting one side of test lamp to the positive battery post and the other side of the test lamp to a test probe. Connect another test probe connected to the negative battery post.

(c) Contact the outer case of the rectifier with one probe and the other probe to the wire in the center of the rectifier (See Fig. 23).

(d) Reverse the probes, moving one probe from the rectifier outer case to the rectifier wire, and the other probe from the rectifier wire to the rectifier outer case.

If the test lamp "lights" in one direction but does "not light" in the other direction, the rectifier is satisfactory. If lamp lights in "both directions", the **rectifier** is "shorted". If the test lamp does "not light" in either direction, the rectifier is "open".

NOTE: Possible cause of an open or a blown rectifier is a faulty capacitor or a battery that has been installed on reverse polarity. If the battery is installed properly and the rectifiers are open, test the capacitor capacity—.50 microfarad plus or minus 20%.

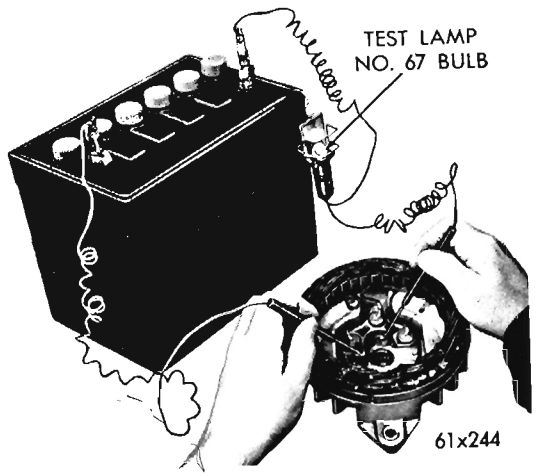


Fig. 23—Testing the Rectifiers with Test Lamp (Typical)

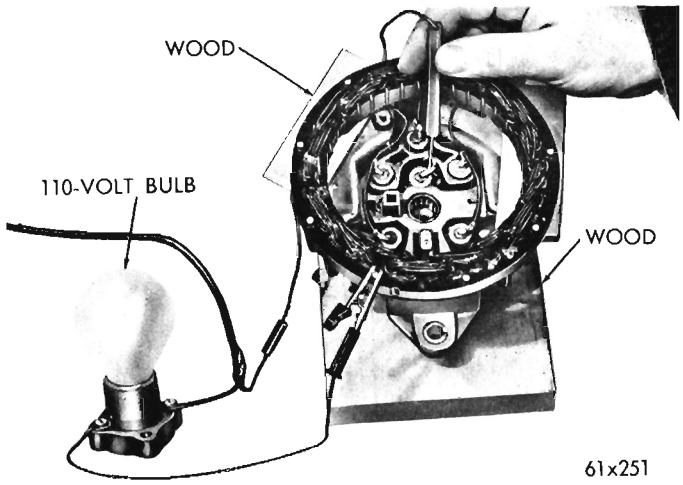


Fig. 24—Testing the Stator for Grounds (Typical)

(e) Unsolder the rectifiers from the stator leads.

(f) Test the stator for grounds using a 110 volt test lamp (Fig. 24). Use wood slats to insulate the stator from the rectifier shield. Contact one prod of the test lamp to the stator pole frame, and contact the other prod to each of the three stator leads. The test lamp should "not light". If the test lamp lights, the stator windings are "grounded".

(g) Test the stator winding for continuity by contacting one prod of the test lamp to **all** three stator leads at the "Y" connection. Contact each of the three stator leads (disconnected from the rectifiers). The test lamp should "light" when the prod contacts each of the three leads. If the test lamp does not light the stator winding is "open" (See Fig. 25).

(h) Install a new stator if the one tested is

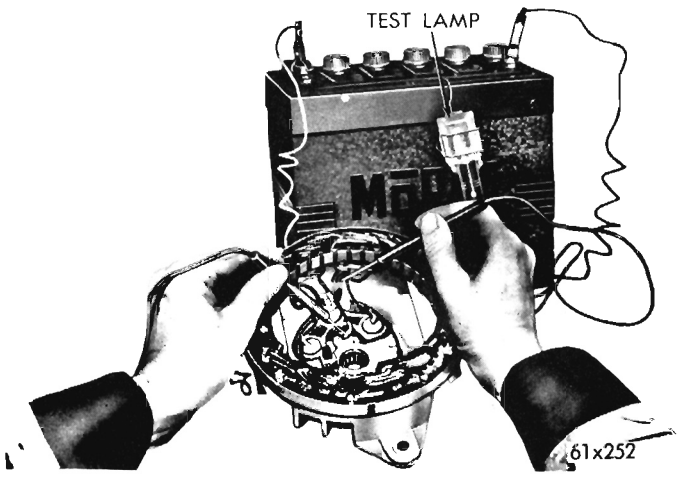


Fig. 25—Testing the Stator Windings for Continuity (Typical)

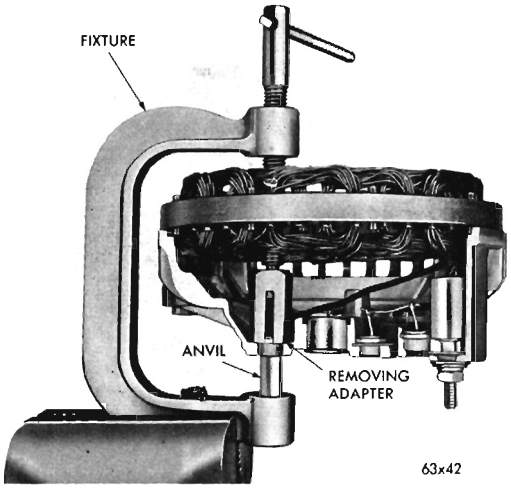


Fig. 26—Removing a Rectifier

"grounded" or "open". If the rectifiers must be replaced unsolder the rectifier wire at the soldered joint.

NOTE: Three rectifiers are pressed into the heat sink and three in the end shield. When removing the rectifiers, it is necessary to support the end shield and/or heat sink to prevent damage to these castings.

(i) Place the rectifier support adapter in the platform of Tool C-3928 and the remover adapter into the end of the tool pressure screw.

(j) Place the clamp tool in a vise and support the end shield on the support adapter under the rectifier to be removed (Fig. 26).

NOTE: The support tool adapter is cutaway and slotted to fit over the wires and around the bosses in the end shield. Make sure that the bore of the tool completely surrounds the rectifier.

(k) Carefully apply pressure with the tool pressure screw, until the support tool rectifier end shield and remover pin are in alignment, then press the rectifier out of the end shield.

8. REPLACING THE SLIP RINGS

Slip rings that are damaged can be replaced as follows:

(1) Cut through the rotor grease retainer with a chisel and remove the retainer and insulator.

(2) Unsolder the field coil leads at the solder lugs (Fig. 27).

(3) Cut through the copper of both slip rings at opposite points (180° apart) with a chisel (Fig. 28).

(4) Break the insulator and remove the old ring.

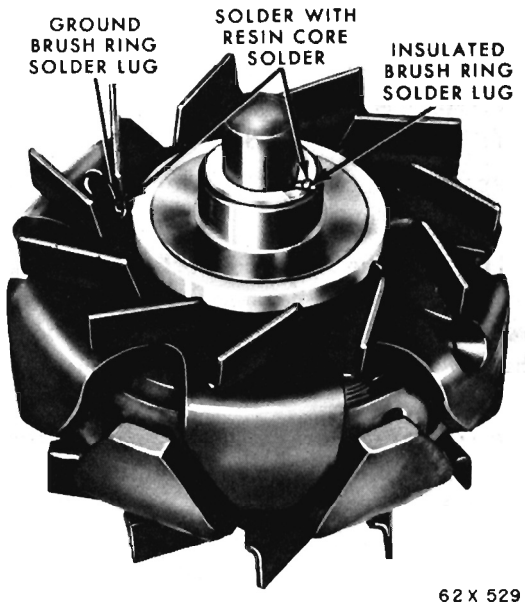


Fig. 27—Solder Points—Slip Ring Installed

(5) Clean away dirt and particles of the old slip ring from the rotor.

(6) Scrape the ends of the field coil lead wires clean for good electrical contact.

(7) Scrape one end (about $\frac{3}{16}$ inch) of a piece of bare wire (approx. 18 gauge) three inches long (to be used as a guide wire).

(8) Tin the scraped area of the guide wire with resin core solder. Lap the tinned end of the wire over the field coil lead to the insulated ring and solder the two together.

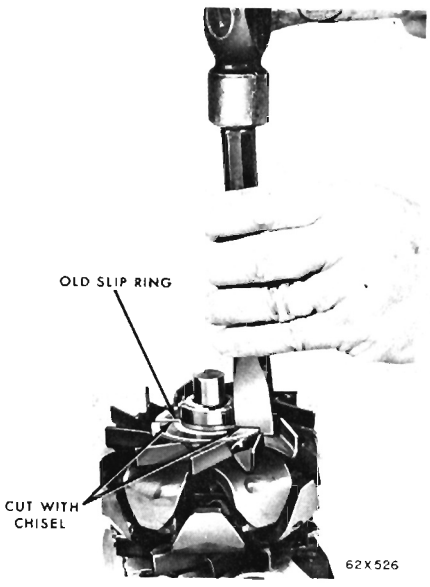


Fig. 28—Cutting the Old Slip Rings

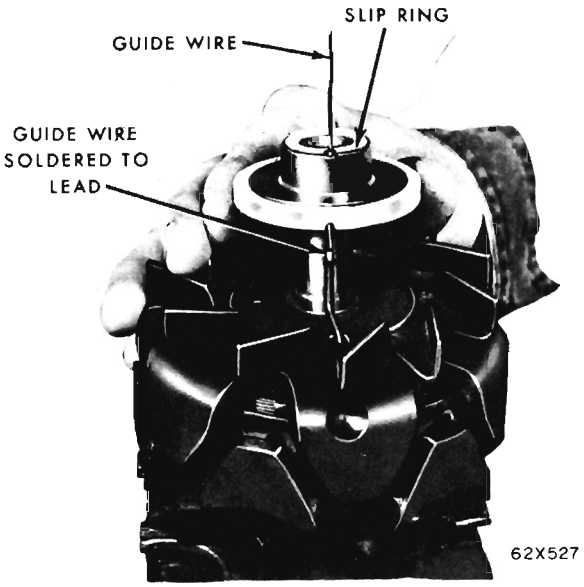


Fig. 29—Aligning the Slip Ring with the Field Wire and Guide Wire

(9) Position the new slip ring carefully over the guide wire and the rotor shaft so the wire will lay in the slip ring groove (Fig. 29). The groove in the slip ring must be in line with the insulated brush field lead to provide room for the lead without damaging it.

(10) Place installing Tool C-3900 over the rotor shaft with the guide wire protruding from the slot in the tool.

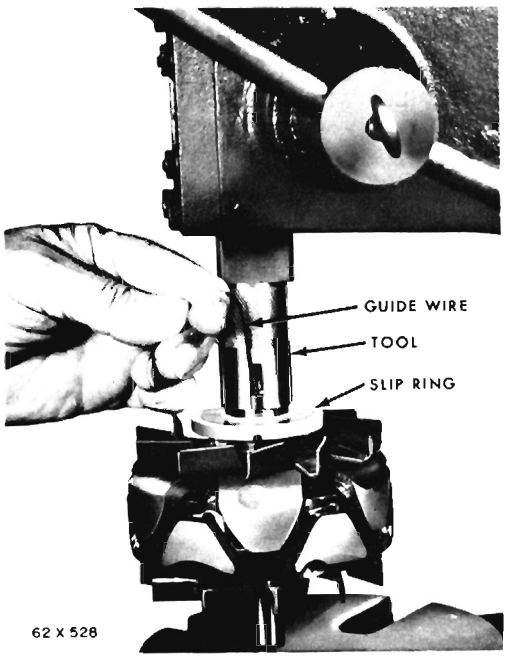


Fig. 30—Installing the Slip Ring

(11) Position the rotor, slip ring and tool assembly in an arbor press (Fig. 30). Pull upon the guide wire being careful to guide the insulated field lead into the slip ring groove. While guiding the insulated field lead through the groove, press the slip ring on the shaft. When the slip ring is bottomed on the rotor fan the end of the field lead should be visible at the solder lug (Fig. 27).

(12) Unsolder the guide wire from the insulated brush slip ring lead. Press the field lead into the solder lug and solder to lug with resin core solder.

CAUTION: Be sure the solder bead does not protrude beyond the surface of the plastic material. Do not use acid core solder. A short may result and corrosion will definitely occur.

(13) Coil the ground brush field lead around the solder lug and solder with resin core solder.

(14) Test the slip rings for ground with a 110 volt test lamp by touching one test lead prod to the rotor pole shoe and the remaining prod to the slip rings. The test lamp should not light. If the lamp lights, the slip rings are shorted to ground, possibly due to grounding the insulated field lead when installing the slip ring.

If the rotor is not grounded, lightly clean the slip ring surfaces with -00- sand paper and assemble the alternator.

(15) Position the grease retainer gasket and grease retainer on the rotor shaft and press the retainer on the rotor shaft with Installer Tool C-3921. Fig. 31. Retainer is properly positioned when inner bore of installer tool bottoms on rotor shaft.

Assembly

(1) Test the rectifier identification to make sure

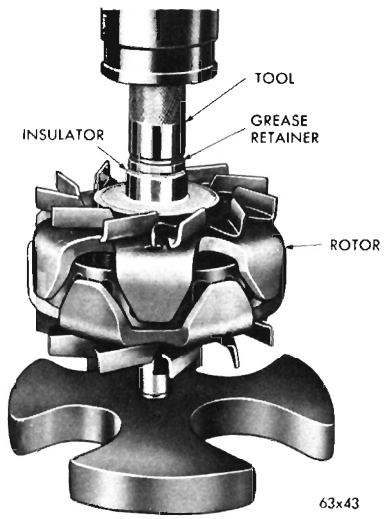


Fig. 31—Installing the Bearing Grease Retainer

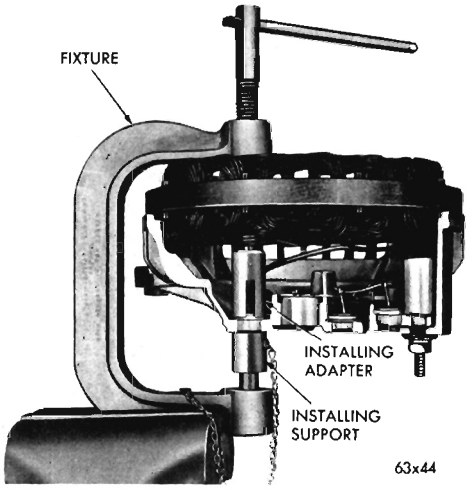


Fig. 32—Installing a Rectifier

the correct rectifier is being installed. Refer to MoPar Parts List for rectifier identification.

(2) Support the heat sink or rectifier end shield on the installer adapter SP-3820 of Tool C-3928. With the installing adapter positioned on the rectifier, carefully apply pressure with the tool pressure screw until the installer tool, rectifier, rectifier end shield or heat sink are in alignment and after determining that the rectifier is started squarely in the casting, slowly apply pressure with the tool pressure screw until you feel the collar of the rectifier bottom against the casting (Fig. 32).

NOTE: Make sure that the installer support adapter fits squarely around the rectifier inner boss and that pressure is applied on the outer rim of the rectifier.

CAUTION: DO NOT USE a hammer to start the rectifier into its bore in the end shield. DO NOT HAMMER OR SHOCK the rectifier in any manner as this will fracture the thin silicon wafer in the rectifier causing complete rectifier failure.

(3) Clean the leads and mate the stator lead with the rectifier wire loop and bend the loop snugly around the stator lead to provide a good electrical and mechanical connection. Solder the wires with resin core solder. Hold the rectifier lead wire with pliers just below the joint while soldering (Fig. 33). The pliers will absorb the heat from soldering and protect the rectifier.

NOTE: After soldering, quickly cool the soldered connection with a dampened cloth. This will aid in forming a solid joint.

(4) After soldering, the stator leads must be pushed down into the slots that are cast into the end shield and cemented with MoPar Cement Part Number 2299314 to protect the leads against possible interference with the rotor fans. Test each replacement rectifier to make certain the rectifier was not damaged by the soldering or pressing operations.

(5) Support the end shield on Tool C-3925 so that the notches in the support tool will clear the raised section of the heat sink and press the bearing into position with Tool SP-3381 (Fig. 34).

NOTE: New bearings are pre-lubricated and additional lubrication is not required.

(6) Insert the drive end bearing in the drive end shield and install the bearing retainer plate to hold the bearing in place.

(7) Position the bearing and drive end shield on the rotor shaft and, while supporting the base of the rotor shaft, press the bearing and shield into position on the rotor shaft with arbor press and Tool C-3769 (Fig. 35).

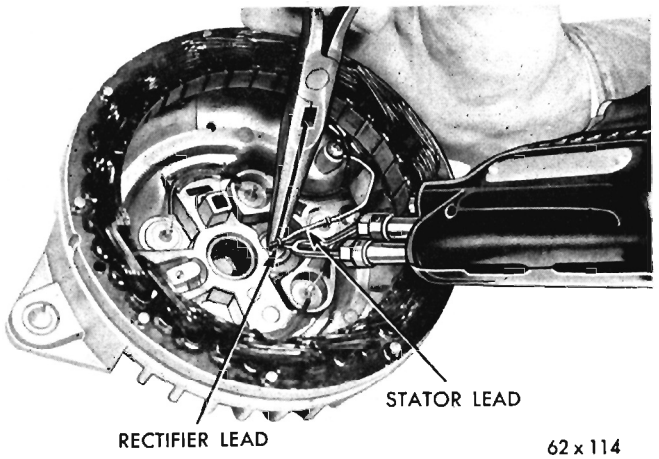


Fig. 33—Solder the Rectifier and Stator Leads

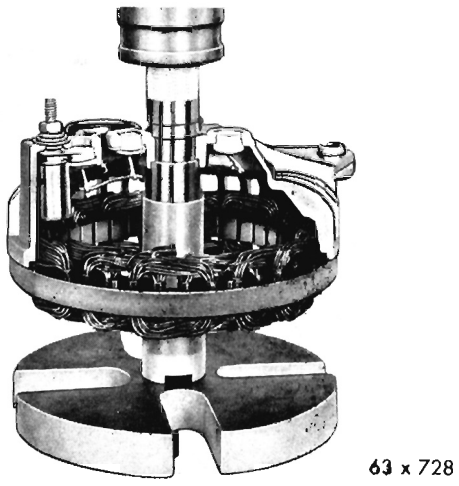


Fig. 34—Installing the Rectifier End Shield Bearing

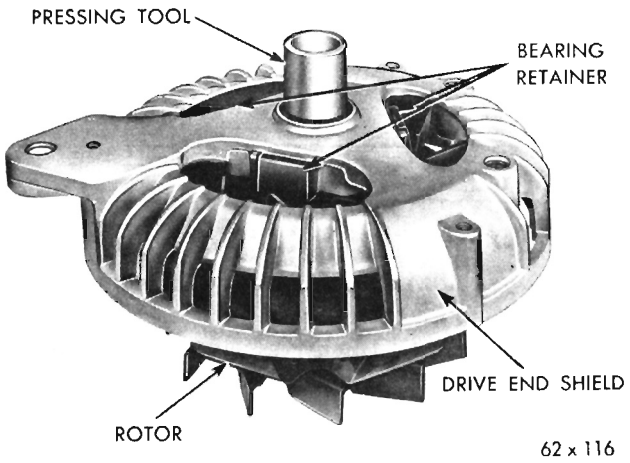


Fig. 35—Installing the Drive End Shield and Bearing

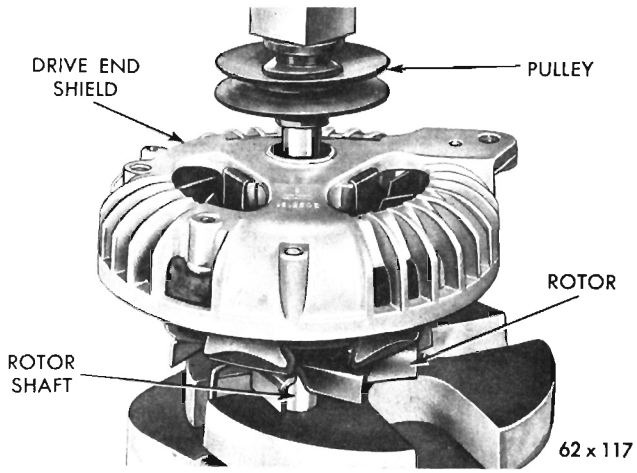


Fig. 36—Installing the Alternator Pulley

CAUTION: Make sure that the bearing is installed squarely at installation; otherwise, damage to the bearing will result. Press the bearing on the rotor shaft until the bearing contacts the shoulder on the rotor shaft.

(8) Install the pulley on the rotor shaft. The shaft of the rotor must be supported in a manner so that all pressing force is on the pulley hub and rotor shaft (Fig. 36).

NOTE: Do not exceed 6800 pounds pressure. Press the puller on the rotor shaft until the pulley contacts the inner race of the drive end bearing.

(9) The alternators have the capacitor mounted internally. Make sure the heat sink insulator is in place (Fig. 18).

(10) Install the capacitor stud through the heat sink and end shield.

(11) Install the insulating washers, lockwashers and lock nuts.

(12) Make sure the heat sink and insulator are in position and tighten the lock nut.

(13) Position the stator on the rectifier end shield.

(14) Position the rotor end shield assembly on the stator and rectifier end shield. Align the through bolt holes in the stator, rectifier end shield and drive end shield.

(15) Compress the stator and both end shields by hand and install the through bolts, washers and nuts.

(16) Install the insulated brush in the rectifier end. Place the bronze terminal on the plastic holder with the tab of the terminal in the recess in the plastic holder.

(17) Place the nylon washer on the bronze terminal and install the lockwasher and attaching screws.

(18) Install the ground brush and attaching screw.

(19) Rotate the pulley slowly by hand to be sure that the rotor fans do not hit the rectifiers, capacitor lead, and stator connections.

(20) Install the alternator and adjust the drive belt.

(21) Connect the output "BAT" and the field "FLD" leads and connect the ground wire.

(22) Connect the battery ground cable.

(23) Start and operate the engine, and observe the alternator operation.

(24) Test the current output and regulator voltage setting, if necessary.

SERVICE DIAGNOSIS

ALTERNATOR

Condition	Possible Cause	Correction
Alternator Fails to Charge (No Output)	(a) Blown fusible wire in voltage regulator.	(a) Locate and correct the cause of the fuse blowing. Install a new fuse wire. Solder both ends of a new fusible wire securely.
	(b) Alternator drive belt loose.	(b) Adjust the drive belt according to Specifications under "Cooling System", Group 7.
	(c) Worn brushes and/or slip rings.	(c) Install new brushes and/or slip rings.
	(d) Sticking brushes.	(d) Clean the slip rings and brush holders. Install new brushes.
	(e) Open field circuit.	(e) Test all the field circuit connections, and correct as required.
	(f) Open charging circuit.	(f) Inspect all connections in the charging circuit, and correct as required.
	(g) Open circuit in stator windings.	(g) Remove the alternator and disassemble. Test the stator windings. Install a new stator if necessary.
	(h) Open rectifiers.	(h) Remove the alternator and disassemble. Test the rectifiers. Install new rectifiers if necessary.
Low, Unsteady Charging Rate	(a) Alternator drive belt loose.	(a) Adjust the alternator drive belt. See "Cooling System", Group 7.
	(b) High resistance at battery terminals.	(b) Clean and tighten the battery terminals.
	(c) High resistance in the charging circuit.	(c) Test the charging circuit resistance. Correct as required.
	(d) High resistance in the body to engine ground lead.	(d) Tighten the ground lead connections. Install a new ground lead if necessary.
	(e) Open stator winding.	(e) Remove and disassemble the alternator. Test the stator windings. Install a new stator if necessary.
Low Output and a Low Battery	(a) High resistance in the charging circuit.	(a) Test the charging circuit resistance and correct as required.
	(b) Low regulator setting.	(b) Adjust the voltage regulator.
	(c) Shorted rectifier. Open rectifier.	(c) Perform the current output test. Remove and disassemble the alternator. Test the rectifiers. Install new rectifiers as required.
	(d) Grounded Stator windings.	(d) Remove and disassemble the alternator. Test the stator windings. Install a new stator if necessary.
Excessive Charging Rate to a Fully Charged Battery	(a) Regulator set too high.	(a) Reset the voltage regulator according to Specifications.
	(b) Regulator contacts stuck.	(b) Install a new voltage regulator.
	(c) Regulator voltage winding open.	(c) Install a new voltage regulator.
	(d) Regulator base improperly grounded.	(d) Connect the regulator base to the ground connection.

SERVICE DIAGNOSIS

ALTERNATOR

Condition	Possible Cause	Correction
Regulator Contacts Oxidized	(a) High regulator setting.	(a) Reset the voltage regulator according to specifications.
	(b) Regulator air gap improperly set.	(b) Reset the voltage regulator air gap and lower the contact gap.
	(c) Shorted rotor field coil windings.	(c) Test the rotor field coil current draw. If excessive, install a new rotor.
Regulator Contacts Burned	(a) High regulator setting.	(a) Reset the voltage regulator according to specifications.
	(b) Shorted rotor field coil windings.	(b) Test the rotor field coil current draw. If excessive, install a new rotor.
Regulator Voltage Coil Windings Burned	(a) High regulator setting.	(a) Install a new voltage regulator. Test the regulator voltage setting and reset if necessary.
Regulator Contacts Points Stuck	(a) Poor ground connection between the alternator and the regulator.	(a) Correct the ground connection. Install regulator voltage setting and reset if necessary.
Noisy Alternator	(a) Alternator mounting loose.	(a) Properly install and tighten the alternator mounting.
	(b) Worn or frayed drive belt.	(b) Install a new drive belt and adjust. See "Cooling System", Group 7.
	(c) Worn bearings.	(c) Remove and disassemble the alternator. Install new bearing as required.
	(d) Interference between the rotor fan and stator leads or rectifiers.	(d) Remove and disassemble the alternator. Correct the interference as required.
	(e) Rotor or rotor fan damaged.	(e) Remove and disassemble the alternator. Install a new rotor.
	(f) Open or shorted rectifiers.	(f) Remove and disassemble the alternator. Test the rectifiers. Install new rectifiers as required.
	(g) Open or shorted winding in the stator.	(g) Remove and disassemble the alternator. Test the stator windings. Install a new stator if necessary.

PART 4

IGNITION SYSTEM (6 CYLINDER)

The ignition system consists of two separate circuits. The battery, ammeter, ignition switch, ballast resistor, primary winding of the ignition coil, distributor contacts and condenser, vehicle frame, and the primary wiring make up the low voltage primary circuit. The secondary high voltage circuit includes the coil secondary winding, the distributor cap and rotor, the high tension wiring, the spark plug and the vehicle frame.

SERVICE PROCEDURES

1. TESTING THE SECONDARY CIRCUIT

The coil to distributor cap wire and the spark plug wires should make good, clean contact in the ignition coil, the distributor cap towers and on the spark plugs. Wires that are loose or that are not inserted all the way into the towers or on the plugs will corrode and increase resistance as well as cause carbon tracking of the coil or cap towers.

Make sure the cap nipples and spark plug covers are in good condition and pushed down securely on the cap towers and around the spark plug insulators. Push the plug covers tight against the cylinder head.

The ignition coil tower, if oily or dirty, should be wiped clean and inspected for cracks, carbon tracking oil leaks. Replace the coil if defective.

Inspect the distributor cap for oil film, dirt or metal particles on the inside surface. Any contamination, however slight, can become conductive and cause hard starting in wet weather. Thoroughly wash the cap in a weak solution of liquid soap or detergent in warm water. Do not use a concentrated solution or soak the cap in the solution. Scrub the inner surfaces with a stiff bristle nylon brush to clean between the ribs and the crevices. Rinse well in hot water, shake out excess water and dry thoroughly. Do not use compressed air to dry or blow out the water. Carefully inspect for cracks or carbon tracking on the inner and outer surfaces. Replace the cap if defective.

Old, cracked, or damaged wires should be replaced. The secondary cables, cap and rotor should be tested, using Tool C-3296. This tester provides high voltage which is sufficient for testing secondary insulation.

Test the resistance type wire for an open circuit, loose terminals or high resistance. Replace the cable if resistance is more than 30,000 ohms, or if the terminal has pulled off the cable.

NOTE: Jerking the wires to disconnect them from the plugs can stretch them and increase secondary resistance. To remove the wire, grasp the boot at the end of the wire and rotate the boot slightly to break the adhesion between it and the spark plug insulator. Then use a straight pull to remove from the spark plug.

The rotor and distributor cap electrodes should be inspected for burning. Replace the rotor if the electrode is burned on the top or if electrode is worn too short.

2. DISTRIBUTOR RESISTANCE TEST

This test indicates the resistance of the ignition primary circuit from the distributor side of the coil, through the points and the distributor ground. Excessive resistance in this portion of the ignition system will prevent the coil from producing sufficient output for good over-all ignition. To perform test, proceed as follows:

(1) Turn the Selector Switch of a tach-dwell unit to the CALIBRATE position and adjust the Dwell Calibrator until the Dwell Meter reads on the set line (test leads separated).

(2) Leave Selector Switch in the CALIBRATE position, connect the tach-dwell red lead to the distributor terminal of coil and the black lead to a good ground.

(3) Turn ignition switch "ON". Observe dwell meter reading. Meter pointer should be well within the black bar marked "DISTRIBUTOR RESISTANCE." If reading is zero or outside of black bar, crank engine with starter until the meter pointer moves as far to right as possible (This will indicate that breaker points are closed). A reading now within the black indicates a normal distributor primary circuit.

If reading is outside the black bar, high resistance is present in the distributor primary circuit.

(4) Remove test lead from the distributor terminal of coil and connect to the following points:

(a) Distributor primary terminal (outside)

(b) Distributor primary terminal (inside)

(c) Breaker point terminal bracket (insulated bracket)

(d) Ground side of contact points

(e) Distributor housing

(5) Repeat test at each connection until a noticeable change occurs in the meter reading. If a bad connection or faulty lead is indicated, clean, tighten or replace as necessary and repeat test (3).

If bad points are indicated, remove distributor for complete inspection, service, testing and calibration.

3. IDLE RPM TEST

The engine idle rpm setting should be tested and recorded as it is when the vehicle is first brought into the shop for testing. This will assist in diagnosing complaints of engine stalling or complaints of creeping and hard shifting on vehicles equipped with automatic transmissions. Test procedures are as follows:

(1) Turn the Selector Switch to the CALIBRATE position and adjust Dwell Calibrator until the Dwell Meter reads on the SET line (test leads separated).

(2) Connect the red lead of the test unit to the distributor primary terminal at coil and the black lead to a good ground.

(3) Turn the Selector Switch to the 6 LOBE position.

(4) Turn the tachometer rpm switch to the 1000 rpm position.

(5) With engine at normal operating temperature (off fast idle), momentarily open the throttle and release to make sure there is no bind in the linkage and that the idle speed screw is against its stop.

(6) Note engine rpm on 1000 rpm scale and adjust carburetor idle speed screw to "Specifications". See "Fuel System" Specifications Group 14.

4. DISTRIBUTOR POINT DWELL

The degrees of dwell of the distributor breaker points are the degrees of rotation through which the breaker points remain closed. This is also commonly referred to as "dwell angle" or "cam angle." Correct distributor point dwell is essential for good ignition performance and point life. Test procedures are as follows:

(1) Connect the Tach-Dwell red lead to the distributor terminal of coil and black lead to a good ground.

(2) Turn the Selector Switch to the 6 LOBE position.

(3) Start the engine and operate at idle speed.

(4) Observe the dwell meter reading. If the dwell reading is within "Specifications", the point gap, cam rubbing block and breaker arm are all in satisfactory condition.

If the dwell reading is not within specifications, incorrect point gap, defective cam, worn rubbing block or distorted breaker arm is indicated.

5. DWELL VARIATION

This test indicates the mechanical condition of the distributor. Excessive wear in distributor mechanical parts causes dwell variation which will affect ignition timing. Test procedures are as follows:

(1) With engine at idle speed, vacuum hose disconnected, and with the test leads connected as in the Point Dwell Test, Paragraph 4, turn the Tachometer rpm Switch to the 5000 rpm position.

(2) Slowly increase the engine speed to 1500 rpm, then slowly reduce to idle speed while observing the dwell meter reading.

If the dwell reading varies more than 3 degrees from initial reading between idle speed and 1500 rpm, probable wear in the distributor shaft, bushings or breaker plate is indicated. Remove distributor for complete inspection and testing on a distributor tester.

NOTE: Dwell variation at speeds above 1500 rpm does not necessarily indicate distributor wear. Dwell and gap of the points must both be within their specified limits at the same time. If this cannot be accomplished, it is probable that wrong points are installed or the rubbing block or cam lobes are badly worn or contact arm is distorted.

6. IGNITION TIMING

To obtain maximum engine performance, the distributor must be correctly positioned on the engine to give proper ignition timing. The ignition timing test will indicate the timing of the spark at No. 1 cylinder at idle (only). Test procedures are as follows:

(1) Disconnect the vacuum hose at distributor.

(2) Connect the secondary lead of Power Timing Light to No. 1 spark plug, red primary lead to positive terminal of battery and black primary lead to the negative battery terminal.

NOTE: Do not puncture the wires, boots or nipples with test probes. Always use adapters. Puncturing spark plug wires with a probe will damage

the wires. The probe can separate the conductor and cause high resistance. In addition breaking the rubber insulation may permit secondary voltage to arc to ground.

(3) Start the engine and set at idle (transmission in neutral).

(4) Use a timing light to observe the position of the timing mark on crankshaft damper and check against specifications.

(5) Loosen the distributor hold-down arm screw and rotate the distributor housing so that crankshaft damper mark aligns with the specified BTC mark on timing plate. Refer to "Specifications." (Moving distributor housing counter-clockwise advances the ignition timing and clockwise retards the timing.)

(6) Tighten the distributor hold-down arm screw after timing has been set and recheck timing adjustment with a Power Timing Light.

(7) When the spark timing is correct, reconnect vacuum hose to distributor.

7. DISTRIBUTOR REMOVAL

(1) Disconnect the vacuum hose at distributor.

(2) Disconnect the primary lead wire at coil.

(3) Unfasten the distributor cap retaining clips and lift off the distributor cap.

(4) Rotate the engine crankshaft until the distributor rotor is pointing toward the cylinder block. Scribe a mark on the block at this point to indicate the position of rotor as reference when reinstalling the distributor.

(5) Remove the distributor hold-down arm screw.

(6) Carefully lift the distributor from the engine.

8. SHAFT AND BUSHING WEAR TEST

(1) Remove the distributor rotor.

(2) Disconnect the primary lead wire at the distributor terminal. **Do not loosen** the movable contact arm spring retaining unit.

(3) Clamp the distributor hold-down arm in a vise equipped with soft jaws and apply only enough pressure to restrict any movement of the distributor during this test.

(4) Attach a dial indicator to the distributor housing so that the indicator plunger arm rests against the movable breaker arm at the rubbing block and with the rubbing block of the breaker arm on the highest point of a cam lobe (Fig. 1).

(5) Place one end of a wire loop around the top of the distributor shaft. Hook a spring scale in the other end of the wire loop and pull on a line with the plunger of the indicator gauge. The wire loop must be down on the distributor shaft to insure a straight pull also be sure that the wire loop does not interfere with the indicator or indicator holding bracket. Apply a five pound pull and read the movement of the plunger on the indicator dial (Be sure the rubbing block of breaker arm is on the highest point of the cam lobe during this test). If the plunger movement exceeds .006 inch, replace the bushings and/or distributor shaft, see "Distributor Disassembly."

9. DISTRIBUTOR

Disassembly (Fig. 2)

(1) Remove distributor rotor.

NOTE: The distributor cap clamp springs are

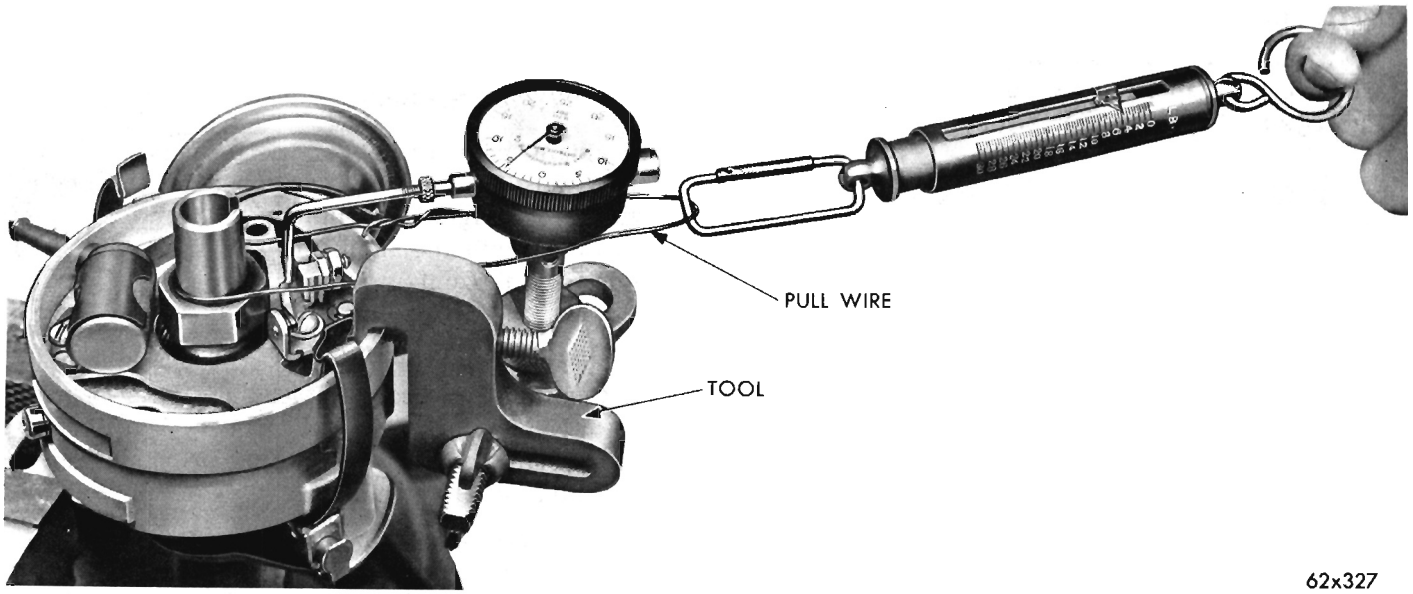


Fig. 1—Checking Distributor Shaft Side Play

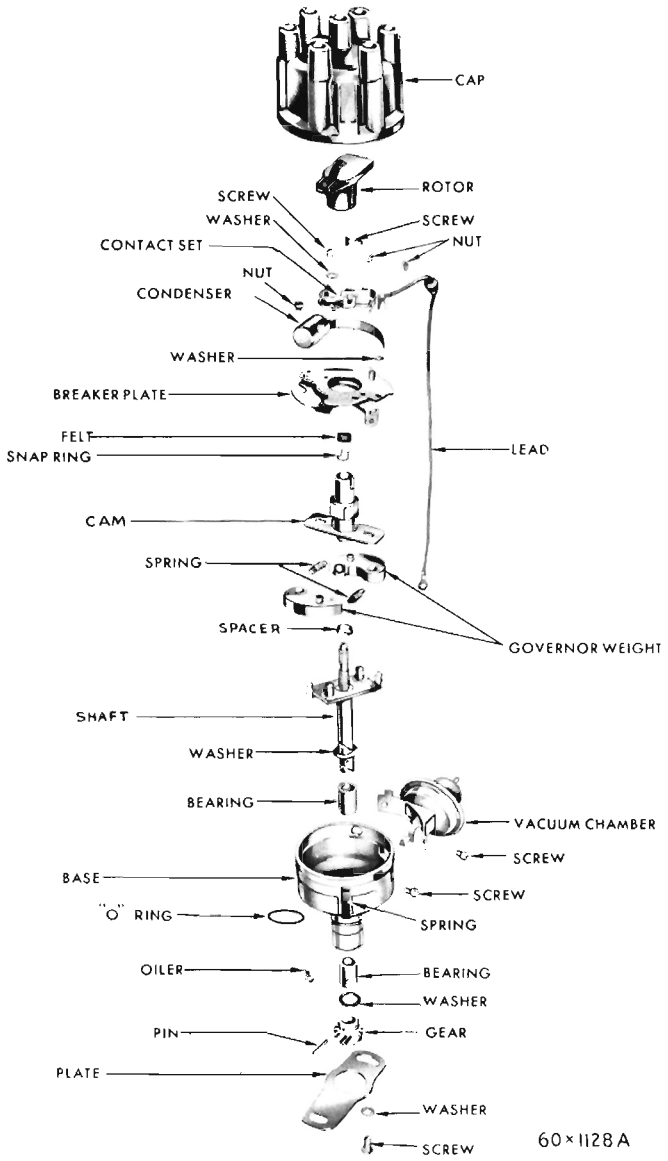


Fig. 2—Six Cylinder Distributor (Exploded View)

held in place by peening the metal around the openings and should not be removed.

(2) Remove the two screws and lockwashers attaching the vacuum control unit.

(3) Remove the primary lead terminal at terminal screw and slide the primary lead off the breaker plate terminal. Remove wire and grommet as an assembly. (Push grommet toward the inside of distributor to remove. Do not pull the wire).

(4) Remove the two screws and lockwashers attaching the breaker plate to housing and lift out the breaker plate, points and condenser as an assembly.

(5) Remove the oil felt wick from the distributor cam (Fig. 3). Remove the wire clip from the oil well in cam (Fig. 4), them remove the cam and yoke assembly, and the spacer.

(6) If side play exceeds .006 inch in the "Shaft and

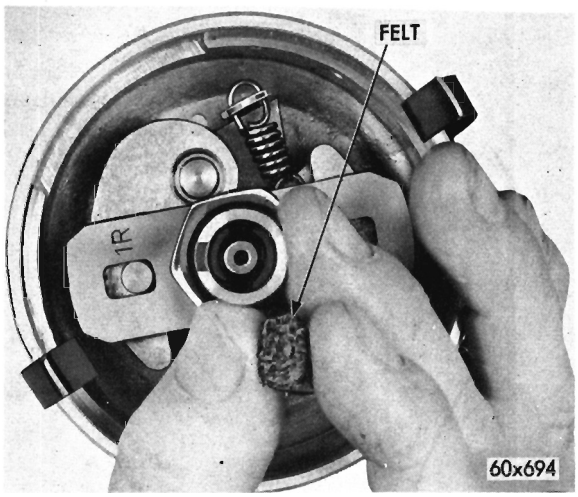


Fig. 3—Removing or Installing the Distributor Cam Felt

Bushing Wear Test," Paragraph 8, replace bushings and/or shaft as follows:

(a) Remove the distributor drive gear retaining pin and slide the gear off the end of the shaft.

CAUTION: Support the hub of gear in a manner that the pin can be driven out of the gear and shaft without damaging the gear teeth.

(b) Use a fine file to clean the burrs from around the pin hole in the shaft and remove the lower thrust washer.

(c) Push shaft up and remove through top of distributor body. Remove the upper thrust washer.

(d) Remove the shaft oiler and lift out the oiler wick.

CAUTION: Do not drive the bushings out of the housing.

(e) Remove the upper bushing with Tool C-3744 (Fig. 5) by threading the tap securely into the bushing. Place the spacer over the tap. Install tool nut

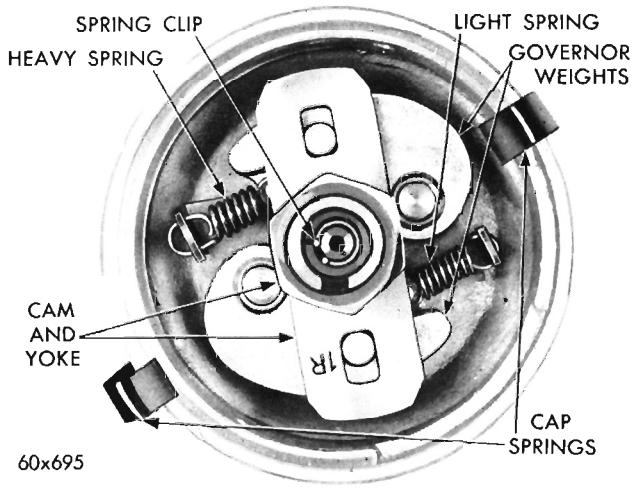


Fig. 4—Distributor Cam Installed

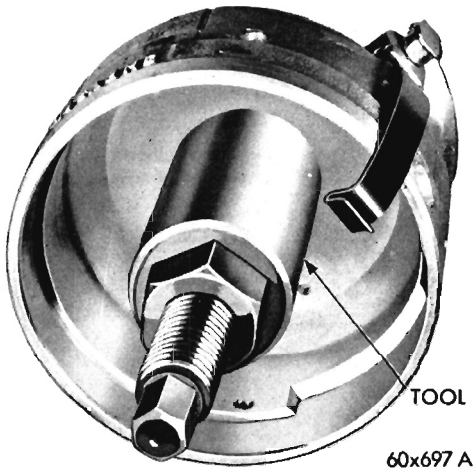


Fig. 5—Removing the Distributor Housing Upper Bushing

and while holding the tool tap, tighten tool nut to remove the bushing. Invert housing and remove the lower bushing in the same manner (Fig. 6).

(f) Soak new bushings in light engine oil for approximately 15 minutes before installation.

(g) Position the new upper bushing with hole in bushing up and in line with oil hole in housing, then press bushing into housing with Tool C-3041 and adapter (flat face of adapter contacting bushing) (Fig. 7) so that upper end of bushing is **above** the top of the housing bore. The upper end of bushing should be 1.613 inch from the top of distributor housing measured from bottom face of straightedge to top of bushing. Invert housing and install lower bushing flush with face of distributor base (Fig. 8).

(h) Insert a $\frac{3}{32}$ inch rod through housing oiler hole to see if hole in bushing indexes with oiler hole in the housing. If the rod cannot be inserted through the housing and bushing, drill a ⅛ inch hole through the upper bushing by drilling through the oil wick hole. Remove burrs caused by the drilling operation, and blow the chips out of the oil hole.

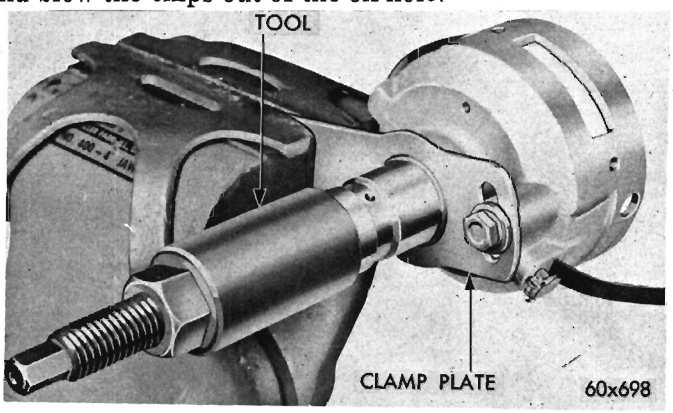


Fig. 6—Removing the Distributor Housing Lower Bushing

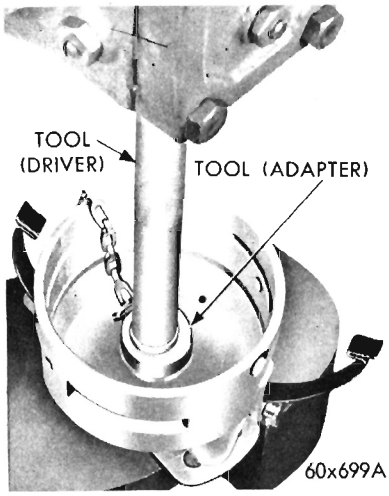


Fig. 7—Installing the Distributor Housing Upper Bushing

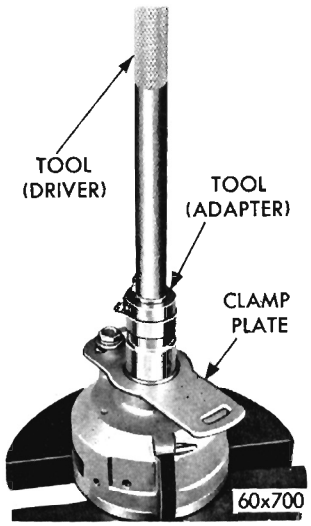


Fig. 8—Installing the Distributor Housing Lower Bushing

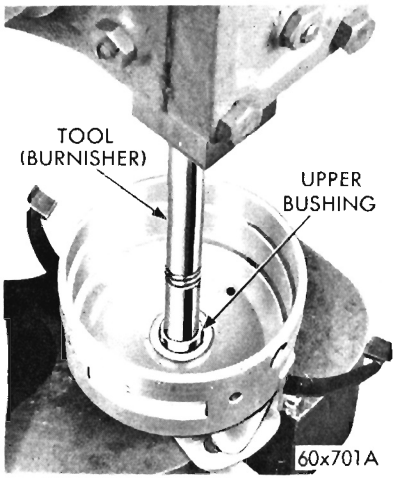


Fig. 9—Burnishing the Distributor Housing Bushing

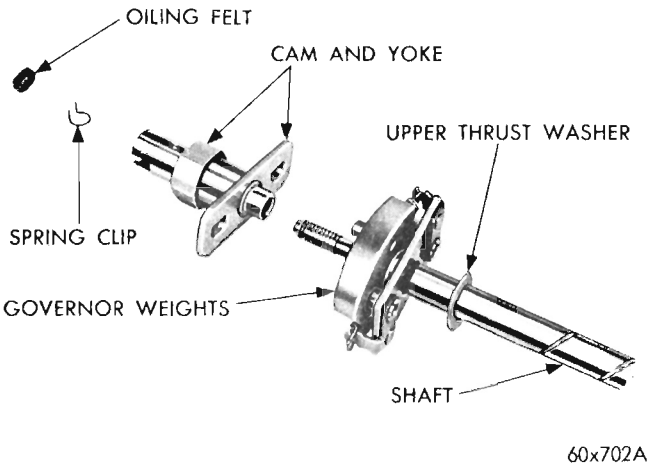


Fig. 10—Distributor Shaft Disassembled

(i) Install the burnishing tool part of Tool Set C-3041 and press the burnisher through both bushings (Fig. 9).

Assembly

(1) Test the operation of centrifugal weight and check weight springs for distortion.

(2) Lubricate the governor weights.

(3) Inspect all bearing surfaces and pivot pins for roughness, binding or excessive looseness.

(4) Install the cam spacer, chamfered end down, on distributor shaft.

(5) Slide the cam and yoke assembly on the distributor shaft and engage the weight lugs with the slots in the yoke (Fig. 10).

(6) Install the cam retaining spring clip (Fig. 4).

(7) Lubricate and install the upper thrust washer (or washers) on the shaft and slide the shaft into the distributor body (Fig. 10).

(8) If the gear is worn or damaged, replace as follows:

(a) Install the lower thrust washer and old gear on the lower end of the shaft and temporarily install the roll pin.

(b) Scribe a line on the end of the shaft from the center to edge, so that the line is centered between two gear teeth as shown in Figure 11. **Do not Scribe completely across the shaft.**

(c) Remove the roll pin and gear. Use a fine file to clean the burrs from around the pin hole.

(d) Install the new gear with thrust washer in place and with hole in gear rotated approximately 90 degrees from the old hole in the shaft and with the scribed line centered between two gear teeth as shown.

NOTE: If it appears that the new pin hole may interfere with the shaft oil groove, rotate the gear to the centerline of the next pair of gear teeth, aligning again with the scribe mark on the end of the shaft.

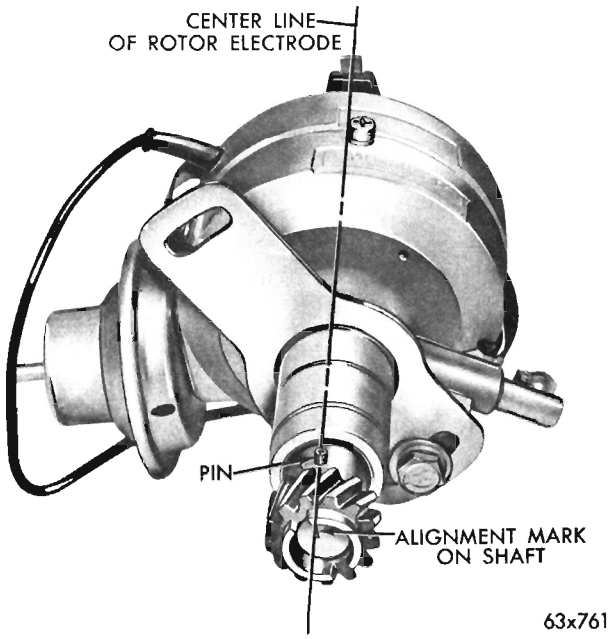


Fig. 11—Scribe Line on the Distributor Shaft

(e) Before drilling through the shaft and gear place a .007 inch feeler gauge between the gear and thrust washer and after again observing that the centerline between two of the gear teeth is in line, with the centerline at the rotor electrode (Fig. 12) drill a .124-.129 inch hole and install the roll pin.

CAUTION: Support the hub of gear when installing the roll pin so that the gear teeth will not be damaged.

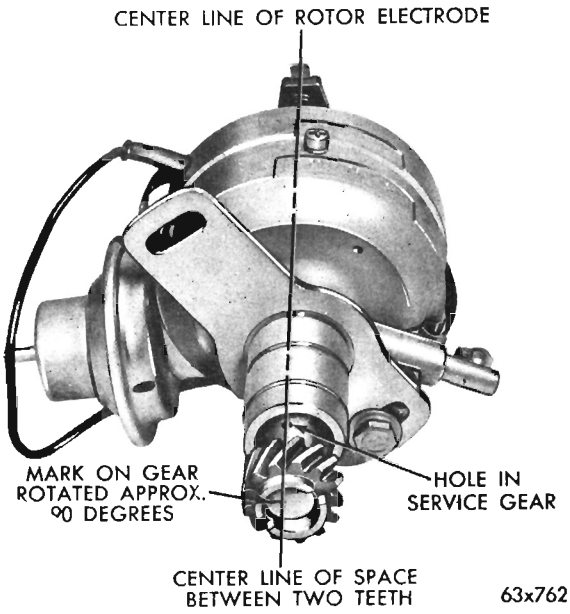


Fig. 12—Drive Gear Alignment at Assembly

(10) Install the breaker plate assembly, align condenser lead, breaker point spring, primary lead, and install attaching screws.

(11) Install the felt wick in top of distributor cam (Fig. 3).

(12) Install the vacuum unit attaching washers and screws.

(13) Test the breaker arm spring tension (Paragraph that follows).

(14) Adjust the contact gap.

(15) Lubricate the felt pad in top of distributor cam with 3 to 5 drops of light engine oil and install rotor.

Testing Breaker Arm Spring Tension

(1) Hook a spring scale MTU-36 on the breaker arm and pull in a straight line at a right angle to the point surfaces (Fig. 13). Take a reading as the points start to separate under the slow and steady pull of the scale. Spring tension should be 17 to 20 ounces. If not, loosen the screw which holds the end of the point spring and slide the end of the spring in or out as necessary.

(2) Retighten the screw and retest the spring tension.

NOTE: Spring tension that is too great, will cause excessive wear on the distributor cam and on the nylon block of the movable breaker arm. Spring tension that is too weak, is unable to keep the points in contact with each other when they close. This is particularly true as engine speed is increased, causing high-speed misfiring.

Installing and Aligning Contact Points

(1) Loosen the terminal screw nut, and remove the primary lead, condenser lead and terminal screw.

(2) Remove the stationary contact lock screw and remove the old contact set.

(3) Install a new contact set; the sleeve at one end of the adjustable bracket fits over and pivots on the upper breaker plate mounting pin, the contact insulator also retains the terminal screw head.

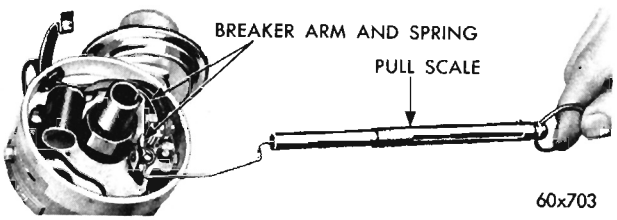


Fig. 13—Testing Breaker Arm Spring Tension

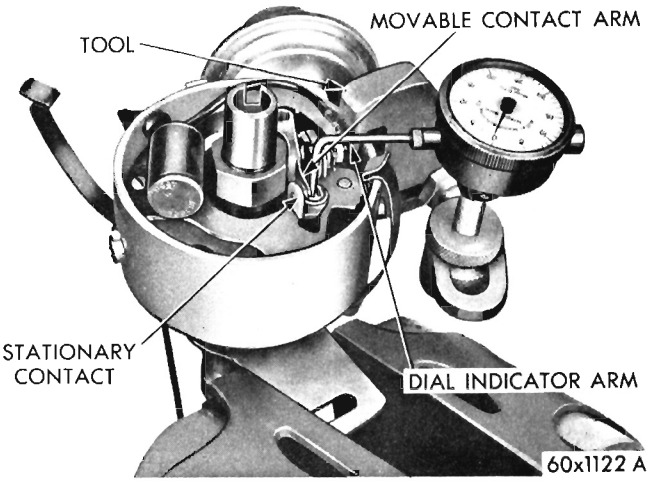


Fig. 14—Checking Point Clearance with Indicator

(4) Connect the condenser and primary leads.

(5) Align the contacts, if necessary, to provide center contact by bending the stationary contact bracket only. **Never bend** movable arm to obtain alignment.

(6) After aligning the contacts, adjust point clearance to "Specifications," using dial indicator (Fig. 14). Retest breaker arm spring tension.

Distributor Lubrication

(1) Add 3 drops of SAE 10W oil to the oiler on the outside of distributor base.

(2) Lubricate felt wick under rotor in top of distributor cam with 3 to 5 drops of SAE 10W oil.

(3) Wipe all old grease from surface of the breaker cam. Apply a light film of new distributor cam grease MoPar Part Number 1473595.

NOTE: Do not over-lubricate. Excess grease will be thrown from the distributor cam when the engine is running. If this grease strikes the contact points, arcing and burning of the points will result.

Testing Distributor Advance Automatic Advance Curve (Centrifugal)

Mount the distributor assembly (less cap and rotor) in a reliable stroboscope-type distributor tester and proceed with tests as follows:

(1) Turn the Tach-Dwell switch to the 6 LOBE position and Motor Switch to the clockwise rotation. Refer to "Distributor Advance Specifications" at the front of this group.

(2) Turn battery switch "ON."

(3) Adjust the tester speed control to operate distributor at 100 distributor rpm.

(4) Hold the distributor breaker plate in the full retard position and align the "O" of distributor tester degree ring with any of the arrow flashes.

(5) Adjust the tester speed control to operate the distributor at speeds called for under "Specifications" and observe arrow flashes opposite tester degree ring to determine degrees of advance.

(6) If the advance is not according to specifications, corrections can be made by bending either the light or heavy governor weight spring tabs to increase or decrease spring tension. Adjust the light spring tension to obtain the first two positions shown in the specifications; adjust the heavy spring tension to obtain the last two positions. The governor spring tabs can be reached through the access hole at the breaker plate. Rotate the shaft until the proper spring and tab lines up with access hole. Insert a screwdriver blade through the access hole and bend the spring tab toward the distributor cam to decrease spring tension and advance the spark, or away from the distributor cam to increase spring tension and retard the spark.

Vacuum Diaphragm Leak Test

With the distributor mounted in Distributor Tester and with vacuum unit attached to the distributor, proceed as follows:

(1) Place thumb over end of vacuum pump hose and adjust the regulator control knob to give a reading of 20 inches of vacuum with hose closed off to insure tester hose does not leak.

(2) Attach vacuum pump hose to the tube on the vacuum unit. Vacuum gauges should hold on maximum vacuum obtainable if no leaks exist.

(3) Observe the breaker plate while performing leak test to check response of breaker plate to vacuum advance. There should be instant response to the pull of the diaphragm, moving the plate without a drag, bind or jerk in either direction.

(4) If leakage is indicated, replace the vacuum unit assembly.

Vacuum Advance Curve

If only the vacuum advance curve is to be checked, connect tester vacuum pump hose to distributor vacuum advance unit and perform operations 1 through 4 under "Automatic Advance Curve." Then proceed as follows:

(1) Turn tester vacuum pump "ON." Adust vacuum pump regulator to vacuum test specifications. See "Specifications" and observe arrow flashes on tester degree ring to determine degrees of advance.

(2) If the vacuum advance is below or above specifications, replace the vacuum advance unit.

Distributor Installation (On the Engine)

(1) Position the distributor on engine. Make certain rubber seal is in groove of distributor shank.

(2) Carefully engage the distributor drive gear with the camshaft drive gear so that when the distributor is installed properly, the rotor will be in line with the scribed line on the cylinder block.

NOTE: If the engine has been cranked while distributor is removed, it will be necessary to establish the proper relationship between the distributor shaft and the Number 1 piston position as follows:

(a) Rotate the crankshaft until **number one piston is at the top of the compression stroke.** (Mark on inner edge of crankshaft pulley should be in line with the "0" (TDC) mark on timing chain case cover.

(b) Rotate the rotor to a position just ahead of the number one distributor cap terminal.

(c) Lower distributor into opening, engaging the distributor gear with the drive gear on the camshaft. With the distributor fully seated on the engine, the rotor should be directly under the cam Number 1 tower with ignition points just separating.

(3) Install the distributor cap (make sure all high tension wires "snap" firmly in the cap towers).

(4) Install the hold-down lock plate screw and tighten finger tight.

(5) Attach the primary lead to coil.

NOTE: Do not connect the distributor vacuum hose at this time.

(6) Connect the secondary lead of a Power Timing Light to the Number 1 spark plug and the red primary lead to the positive terminal of the battery and the black primary lead to the negative battery terminal.

NOTE: Do Not puncture the cable cap nipples or spark plug covers with a sharp tool to make contact. Use the proper adapters.

(7) Start the engine and run at slow idle.

(8) Rotate the distributor housing so that the timing mark on the crankshaft damper is aligned with the "BTC" mark on the chain case cover. Refer to "Specifications." (Moving distributor housing counter-clockwise advances the timing and clockwise retards the timing.)

(9) Tighten distributor hold-down arm screw after timing has been set and recheck timing adjustment with Power Timing Light.

(10) If timing is correct, connect vacuum hose to distributor.

(11) Remove timing light from engine.

10. SPARK PLUGS

Remove the spark plugs. Examine the firing ends of the plugs for evidence of oil fouling, gas fouling, burned or overheating conditions.

Cleaning and Regapping

Carefully clean the spark plugs in an abrasive type cleaner. Use a pin type feeler gauge to check spark plug gap. Reset gaps to .035 inch.

NOTE: Before setting the spark plug gap, file the center electrode flat. Make adjustment by bending the ground side electrode; never bend the center electrode.

Inspect the spark plug cables, coil secondary cable, nipples and covers for cracks, wear and fraying. Test for loose terminals. When installing spark plugs, tighten to 30 foot pounds.

11. IGNITION COIL

The ignition coil is designed to operate with an external ballast resistor.

The ballast resistor is a fixed resistance in the ignition primary circuit. During low speed operation, when the primary circuit current flow is high, the ballast resistor temperature rises, increasing the resistance. This reduces the current flow, thereby prolonging ignition point life. At high speed operation, when the primary current flow is low, the ballast resistance cools off allowing more current flow, which is required for high speed operation. During starter operation, the ballast resistor is bypassed, allowing full battery voltage to the ignition primary circuit.

When testing the coil for output, include the resistor in tests. Inspect the coil for external leaks and arcing.

Test the coil according to the coil tester Manufacturer's instructions. Test the coil primary resistance. Test the ballast resistor resistance. Test the coil secondary resistance. Replace any coil and ballast resistor that does not meet specifications.

IGNITION SYSTEM (8 CYLINDER)

The ignition system consists of two separate circuits. The battery, ammeter, ignition switch, ballast resistor, primary winding of the ignition coil, distributor contacts and condenser, vehicle frame, and the primary wiring make up the low voltage primary circuit. The secondary high voltage circuit includes the coil secondary winding, the distributor cap and rotor, the spark plug cables, the spark plugs and the vehicle frame.

SERVICE PROCEDURES

12. SECONDARY CIRCUIT INSPECTION

The coil to distributor cap wire and the spark plug wires should make good, clean contact in the ignition coil, the distributor cap towers and on the spark plugs. Wires that are loose or that are not inserted all the way into the towers or on the plugs will corrode and increase the resistance as well as cause carbon tracking of the coil or cap towers. Make sure the cap nipples on spark plug covers are in good condition and that they are tight on the cap towers and around the plug insulators.

The ignition coil tower, if oily or dirty, should be wiped clean and inspected for cracks, carbon tracking or oil leaks. Replace the coil if faulty.

Inspect the distributor cap for oil film, dirt or metal particles on the inside surface. Any contamination, however slight, can become conductive and cause hard starting in wet weather. Thoroughly wash the cap in a **weak** solution of liquid soap or detergent in warm water. Do not use a concentrated solution or soak the cap in the solution. Scrub the inner surfaces with a stiff bristle nylon brush to clean between the ribs and the crevices. Rinse well in hot water, shake out excess of water and dry thoroughly. Do not use compressed air to dry or blow out the water. Carefully inspect for cracks or carbon tracking on the inner and outer surfaces. Replace the cap if faulty.

The secondary cables, cap and rotor should be tested, using Tool C-3296. This tester provides high voltage which is sufficient for testing secondary insulation. Test the resistance of the spark plug cables.

Replace the cable if resistance is more than 30,000 ohms, or if the terminal has pulled off the cable.

NOTE: Pulling the wires to disconnect them

from the plugs can stretch them and increase secondary resistance. To remove the wire, grasp the boot at the end of the wire and rotate the boot slightly to break the adhesion between it and the spark plug insulator. Then use a straight pull to remove the spark plug.

The rotor and distributor cap electrodes should be inspected for burning. Replace the rotor if the electrode is burned on the top or if the electrode is worn too short.

13. DISTRIBUTOR RESISTANCE TEST

This test indicates the resistance of the ignition primary circuit from the distributor side of the coil, through the points and the distributor ground. Excessive resistance in this portion of the ignition system will prevent the coil from producing sufficient output for good over-all ignition. To perform test, proceed as follows:

(1) Turn the Selector Switch of a tach-dwell unit to the CALIBRATE position and adjust the Dwell Calibrator until the Dwell Meter reads on the set line (test leads separated).

(2) Leave selector Switch in the CALIBRATE position, connect the tach-dwell red lead to the distributor terminal of coil and the black lead to a good ground.

(3) Turn ignition switch "ON". Observe dwell meter reading. Meter points should be well within the black bar marked "DISTRIBUTOR RESISTANCE". If reading is zero or outside of black bar, crank the engine with the starter until the meter pointer moves as far to right as possible. (This will indicate that breaker points are closed.) A reading now within the black indicates a normal distributor primary circuit.

If the reading is outside the black bar, high resistance is present in the distributor primary circuit.

(4) Remove the test lead from the distributor terminal of coil and connect to the following points:

(a) Distributor primary terminal (outside)

(b) Distributor primary terminal (inside)

(c) Breaker point terminal bracket (insulated bracket)

(d) Ground side of contact points

(e) Distributor housing

(5) Repeat test at each connection until a noticeable change occurs in the meter reading. If a poor connection or faulty lead is indicated, clean, tighten or replace as necessary and repeat test (3).

If faulty contact points are indicated, remove distributor for complete inspection, service, testing and calibration.

14. IDLE RPM TEST

The engine idle rpm setting should be tested and recorded as it is when the vehicle is first brought into the shop for testing. This will assist in diagnosing complaints of engine stalling, creeping and hard shifting on vehicles equipped with automatic transmissions.

Test procedures are as follows:

(1) Turn the Selector Switch to the CALIBRATE position and adjust the Dwell Calibrator until the Dwell Meter reads on the SET line (test leads separated).

(2) Connect the red lead of the test unit to the distributor primary terminal at the coil and the black lead to a good ground.

(3) Turn the Selector Switch to the 8 LOBE position.

(4) Turn the tachometer rpm switch to the 1000 rpm position.

(5) With the engine at normal operating temperature (off fast idle), momentarily open the throttle and release to make sure there is no bind in the linkage and that the idle speed screw is against its stop.

(6) Note engine rpm on 1000 rpm scale and adjust carburetor idle speed to specifications. See "Fuel System" specifications.

15. DISTRIBUTOR POINT DWELL

The degrees of distributor dwell are the degrees of rotation through which the breaker contact points remain closed. This is also commonly referred to as "dwell angle" or "cam angle".

The correct distributor point dwell is essential for good ignition performance and contact point life.

Test procedures are as follows:

(1) Connect the Tach-Dwell red lead to the distributor terminal of coil and black lead to a good ground.

(2) Turn the Selector Switch to the 8 LOBE position.

(3) Start the engine and operate at idle speed.

(4) Observe the dwell meter reading. If the dwell reading is within "Specifications" the point gap, cam rubbing block and breaker arm are all in satisfactory condition.

If the dwell reading is not within specifications, incorrect point gap, worn cam, worn rubbing block or distorted breaker arm may be indicated.

16. DUAL BREAKER POINTS

Block one set of contacts with a clean insulator and

adjust the opposite set of contacts to specifications using the dwell meter.

NOTE: Loosen the stationary contact lock screw just enough, so that the stationary contact can be moved with a slight drag; otherwise it will be difficult to set the contacts accurately.

When the one set of contacts has been adjusted for the correct clearance, tighten the stationary contact lock screw.

Block the adjusted set of contacts with an insulator and adjust the remaining set of contacts in the same manner as the first set. Remove insulator and recheck tightness of the stationary contact lock screw.

If the contacts have been properly adjusted, the dwell should be as specified for two contact sets.

17. DWELL VARIATION

This test indicates the mechanical condition of the distributor. Excessive wear in distributor mechanical parts cause dwell variations which will affect ignition timing.

Test procedures are as follows:

(1) With the engine at idle speed, the vacuum hose disconnected, and with the test leads connected as in Paragraph, "Point Dwell Test", turn the Tachometer rpm Switch to the 5,000 rpm position.

(2) Slowly increase the engine speed to 1500 rpm, then slowly reduce to idle speed while observing the dwell meter reading.

If the dwell reading varies more than 2 degrees from initial reading between idle speed and 1500 rpm, probable wear in the distributor shaft, bushings or breaker plate bearing and pivot pin is indicated. Remove distributor for complete inspection and testing on a distributor tester.

NOTE: Dwell variation at speeds above 1500 rpm does not necessarily indicate distributor wear. Dwell and gap of the points must both be within their specified limits at the same time. If this cannot be accomplished, it is probable that wrong points are installed or the rubbing block or cam lobes are badly worn or movable contact is distorted.

18. IGNITION TIMING

To obtain maximum engine performance, the distributor must be correctly positioned on the engine to give the proper ignition timing.

The ignition timing test will indicate the timing of the spark at No. 1 cylinder at idle (only).

Test procedures are as follows:

(1) Disconnect the vacuum hose at the distributor.

(2) Connect the secondary lead of the Power Timing Light to the No. 1 spark plug, red primary lead to the positive terminal of the battery and the black primary lead to the negative battery terminal.

NOTE: Do not puncture the wires, boots or nipples with test probes. Always use adapters. Puncturing spark plug wires with a probe will damage the wires. The probe can separate the conductor and cause high resistance. In addition, breaking the rubber insulation may permit secondary current to arc to ground.

(3) Start the engine and set the idle to specifications, engine at normal operating temperature (transmission in neutral).

(4) Using a timing light, observe the positions of timing mark on the crankshaft damper and check against the specifications.

(5) Loosen the distributor hold down clamp screw and rotate the distributor housing so that the specified timing mark on damper aligns with the specified "BTC" mark on the timing plate. Moving the distributor "clockwise" advances the timing and "counterclockwise" retards the timing.

(6) Tighten the distributor hold down clamp screw after the timing has been set and recheck the timing adjustment with a Power Timing Light.

(7) When the ignition timing is correct, connect the vacuum hose to the distributor.

NOTE: As the engine speed is increased, the timing mark should move down on the vibration dampener below the pointer if advance units are functioning.

19. DISTRIBUTOR

Removal

(1) Disconnect the vacuum hose at the distributor.

(2) Disconnect the primary lead wire at the coil.

(3) Unfasten the distributor cap retaining clips and lift off the distributor cap.

(4) Scribe a mark on the edge of the distributor housing to indicate the position of the rotor as reference when reinstalling the distributor.

(5) Remove the distributor hold-down clamp screw and the clamp.

(6) Carefully lift the distributor from the engine.

Shaft and Bushing Wear Test

(1) Remove the distributor rotor.

(2) Clamp the ribbed section of the distributor housing lightly in a vise equipped with soft jaws

and attach the dial indicator to the body of the distributor with the indicator plunger arm resting against the moveable breaker arm with the rubbing block of the breaker arm on the highest point of the cam lobe (Fig. 15).

(3) Place one end of a wire loop around the top of the distributor shaft. Hook a spring scale in the other end of the wire loop and pull on a line with the plunger of the indicator gauge. Be sure the wire loop on the shaft end is down on the shaft to insure a straight pull and also that the wire loop does not interfere with the indicator or holding bracket. Apply a five pound pull and read the movement of the plunger on the indicator dial (Be sure the rubbing block of breaker arm is on the highest point of the cam lobe during this test). If the plunger movement exceeds .006 inch, replace the bushing and/or distributor shaft, see "Distributor Disassembly".

Disassembly (Figs. 16 and 17)

(1) Remove the distributor rotor.

NOTE: The distributor cap clamp springs on Chrysler built distributors are held in place by peened metal around the openings and should not be removed.

(2) Remove the retainer attaching the vacuum advance unit to the breaker plate advance arm.

(3) Remove the two screws and lockwashers attaching the vacuum advance unit to the distributor housing and remove the unit.

(4) Remove the primary lead wire and rubber grommet as an assembly. Push the grommet towards the inside of distributor to remove. Do not pull the wire.

(5) Remove the two screws and lockwashers attaching the breaker plate to the housing and lift out the breaker plate, points and condenser as an assembly.

(6) Remove the oil wick from the distributor cam (Fig. 18). Remove the spring clip from the oil well in the cam and remove the cam and yoke assembly and spacer.

If the side play exceeds .006 inch in the "Shaft and Bushing Wear Test", replace the bushings and/or distributor shaft as follows:

(a) Remove the distributor drive collar retaining pin and slide the collar off the end of the shaft.

(b) Use a fine file to clean the burrs from around the pin hole in the shaft and remove the lower thrust washer.

(c) Push the shaft up and remove it through the top of the distributor body. Remove the upper thrust washer.

(d) Remove the shaft oiler and lift out the oiler wick.

CAUTION: On Chrysler Built distributors, do not drive the bushings out of the housing.

(e) Remove the upper bushing with Tool C-3744

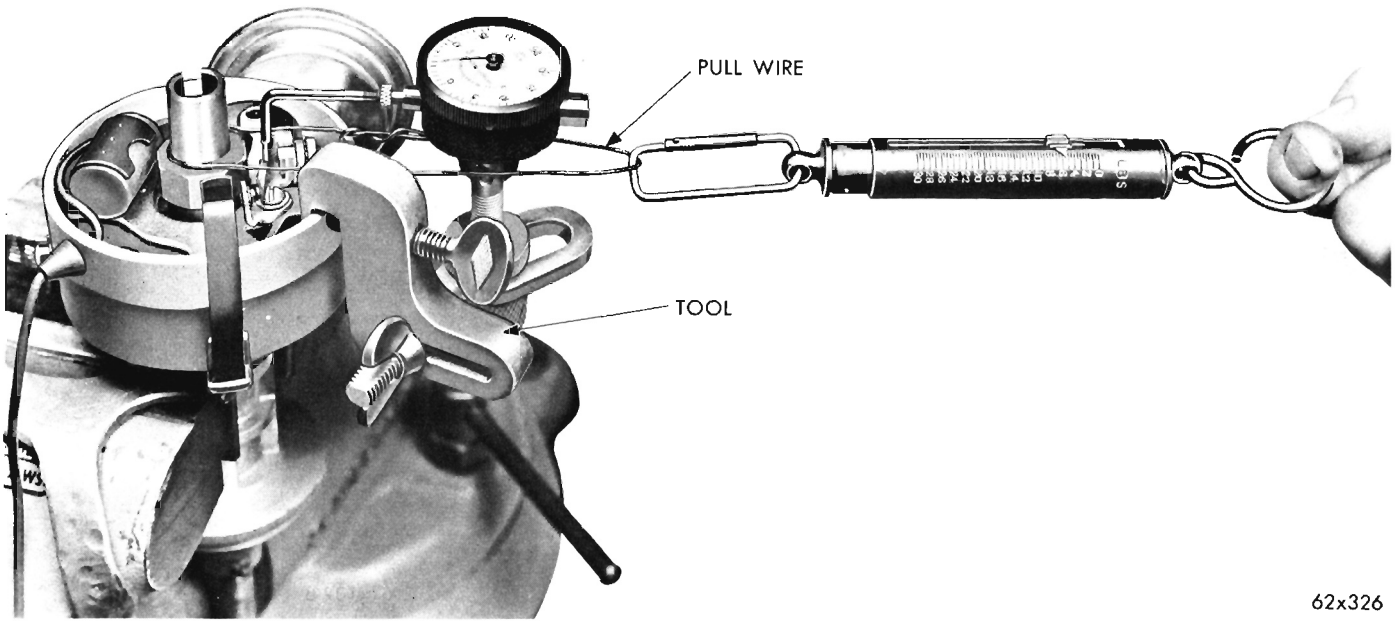
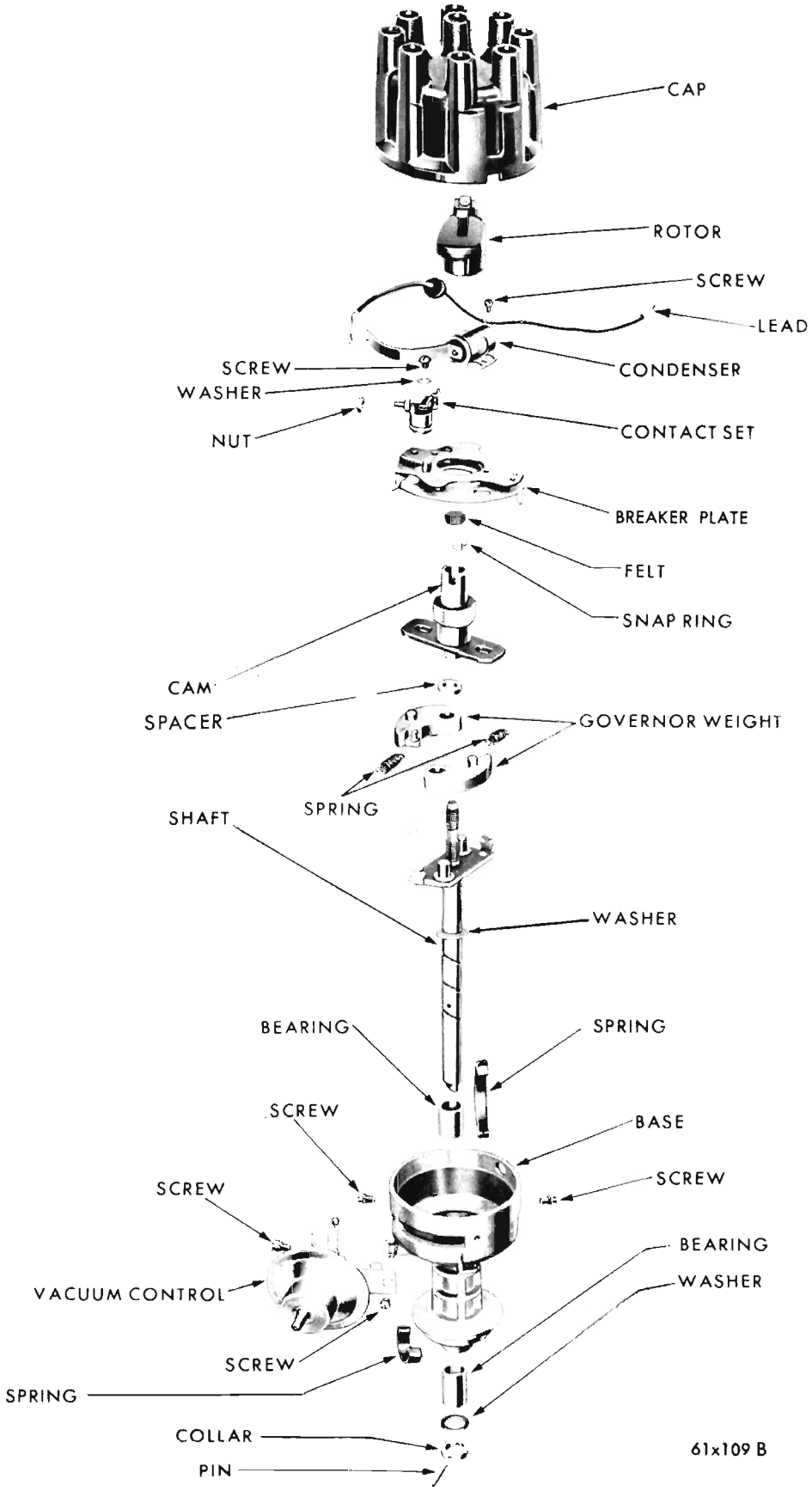


Fig. 15—Shaft and Bushing Wear Test



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Fig. 16—Distributor (Disassembled View) Chrysler Built

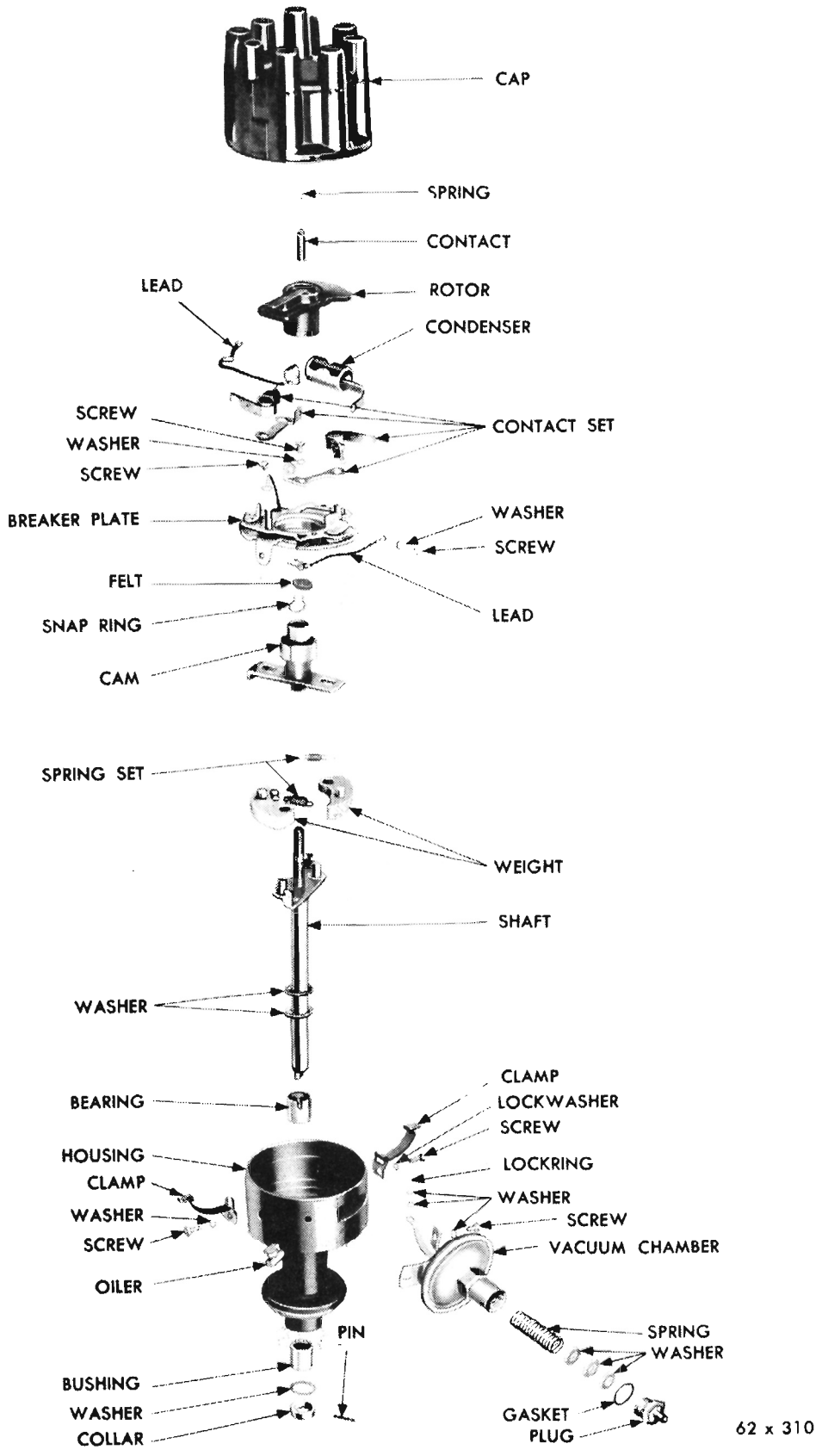


Fig. 17—Distributor (Disassembled View) (Prestolite) (High Performance and Police Engines Only)

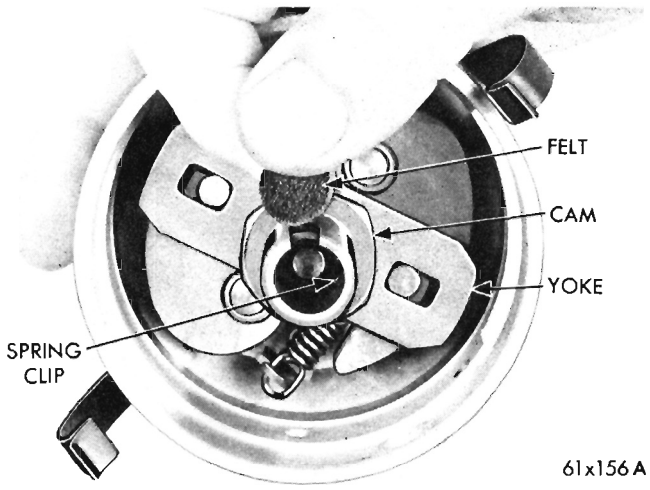


Fig. 18—Removing the Distributor Cam Felt Wick

(Fig. 19) by threading the tap securely into the bushing. Place the spacer over the tap. Install the tool nut and, while holding the tap, tighten the tool nut to remove the bushing. Invert the housing and remove the lower bushing in the same manner.

On Prestolite built distributors, place the housing in an arbor press and press out the upper and lower bushings from the bottom of the housing using driver Tool C-3041.

(f) Soak the new bushing in light engine oil for approximately 15 minutes.

(g) Position the new upper bushing with the hole in the bushing **up** and in line with the oil hole in the housing, then press the bushing into the distributor housing with Tool C-3041 and adapter (Fig. 20). The bushing will measure .094 inch below the top of the housing bore for Prestolite distributors. For the Chrysler built distributors use Tool C-3041 with the flat face of adapter contacting the bushing

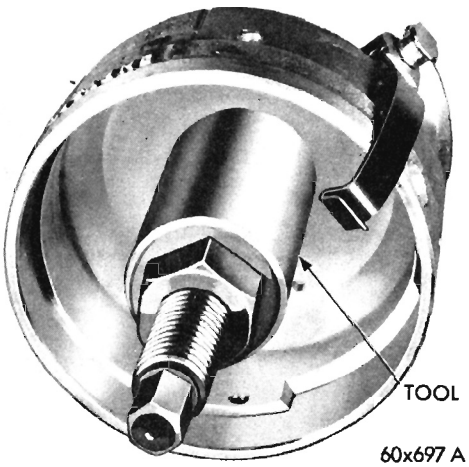


Fig. 19—Removing the Distributor Housing Upper Bushing

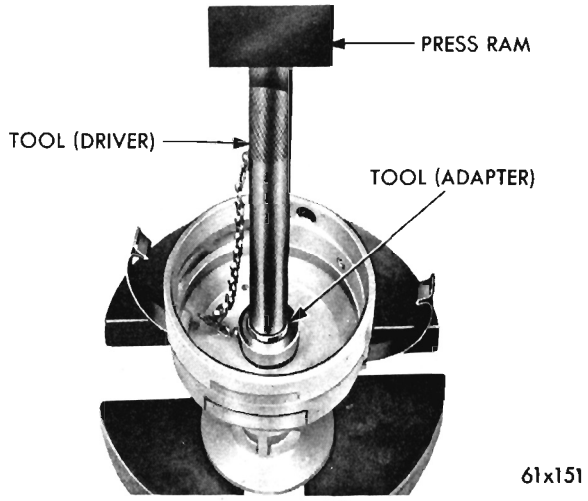


Fig. 20—Installing the Distributor Housing Upper Bushing

then press the bushing into the distributor until top of bushing is 1.1613 inches from the top of the machined face of distributor housing. Place a straightedge on machined surface of housing and measure from the bottom face of the straightedge to the top of the bushing. Invert the housing and install the other bushing (Fig. 21) flush with the face of the distributor base.

(h) Insert a $\frac{3}{32}$ inch rod through the housing oiler hole to see if the hole in the bushing indexes with the oiler hole in the housing. If the rod cannot be inserted through the housing and the bushing, drill a $\frac{1}{8}$" hole through the upper bushing by drilling through the oil wick hole. Remove burrs caused by the drilling operation.

(i) Install the burnishing tool part of Tool set C-3041 and force the burnisher through both the bushings (Fig. 22). The correct bushing inside the diameter is .4994 to .5000 inch.

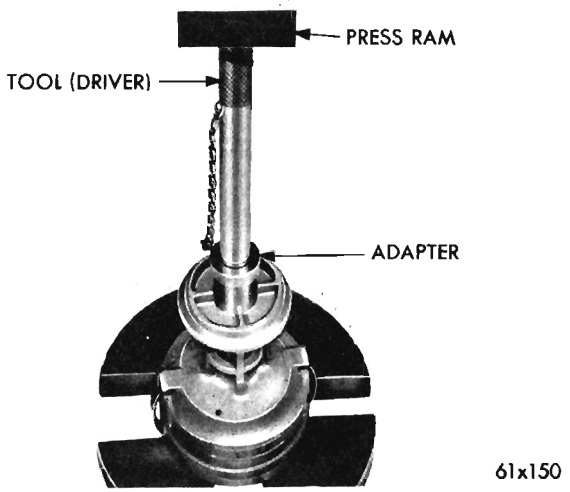


Fig. 21—Installing the Distributor Housing Lower Bushing

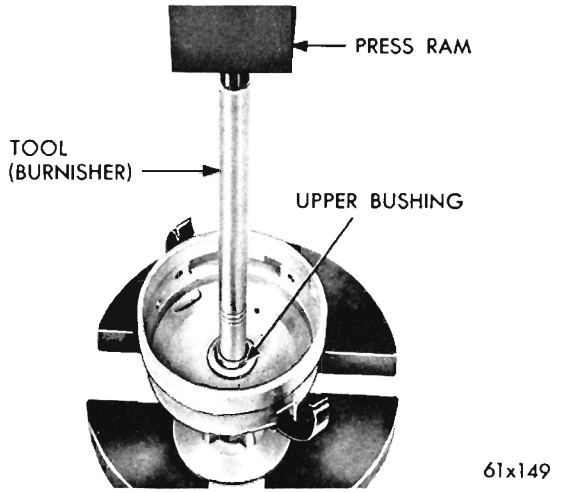


Fig. 22—Burnishing the Distributor Housing Bushings

Distributor Assembly

(1) Test the operation of the centrifugal weight and inspect the weight springs for distortion. Lubricate the governor weights.

(2) Inspect all the bearing surfaces and pivot pins for roughness, binding or excessive looseness.

(3) Install the cam spacer, chamfered end down on the distributor shaft.

(4) Slide the cam and yoke on the distributor shaft, engage the weight lugs with the slots in the yoke. Install the cam retaining spring clip. Be sure it is properly seated in the groove of the distributor shaft.

(5) Lubricate and install the two concave upper thrust washers for Prestolite distributors or a single flat thrust washer for Chrysler-built distributors. Position the washers on the distributor shaft and slide the shaft into the distributor body. Position the lower thrust washer and drive the collar on the lower end of the shaft. Install the retainer pin.

(6) Install the oiler wick and oiler.

(7) Install the breaker plate assembly. Align the condenser lead, breaker point spring, primary lead and install the attaching screws.

(8) Install the felt wick in the top of the distributor cam.

(9) Attach the vacuum advance unit arm to the breaker plate and install the retainer. Install the vacuum unit attaching screws and washers.

(10) Test the breaker arm spring tension, and adjust the contact gap.

(11) Lubricate the felt pad in the top of the distributor cam with 3 to 5 drops of light engine oil and install the rotor.

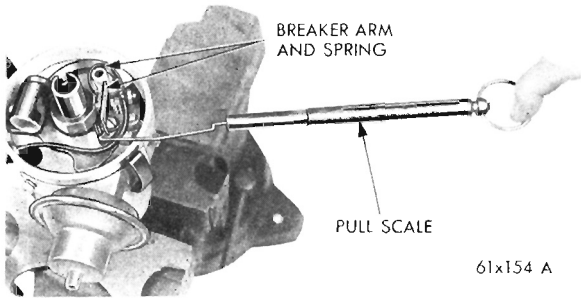


Fig. 23—Testing the Breaker Arm Spring Tension

Testing Breaker Arm Spring Tension

(1) Hook a spring scale Tool MTU-36 on the breaker arm and pull in a straight line at right angles to the point surfaces (Fig. 23). Take a reading as the points start to separate under the slow and steady pull of the scale. The spring tension should be as shown in specifications. If the reading is outside these limits, loosen the screw which holds the end of the breaker arm spring, and slide the end of the spring in or out, as necessary.

(2) Tighten the screw and measure the spring tension.

NOTE: Spring tension that is too great, will cause excessive wear on the distributor cam and on the nylon block of the movable breaker arm. Spring tension that is too weak, is unable to keep the points in contact with each other when they close. This is particularly true as engine speed is increased, causing high-speed misfiring.

Installing and Aligning Contact Points

(1) Remove the old contact points and install a new set.

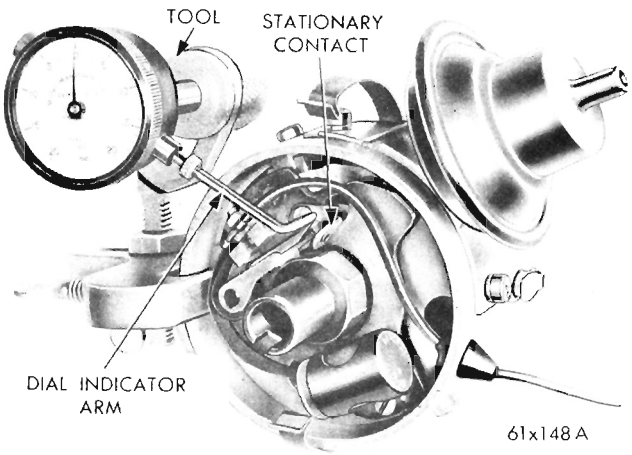


Fig. 24—Adjusting the Contact Point Clearance

NOTE: Touching the contact points faces with fingers during installation will cause burning of points during operation.

(2) Align the contacts to obtain contact in the center of the points by bending the stationary contact bracket only. **Never bend** the movable arm to obtain alignment.

(3) After aligning the contact points, readjust the point clearance to specifications using a dial indicator (Fig. 24).

(4) Test the dwell angle to show proper degree of closure. See Paragraph, "Distributor Point Dwell". The lock screw should be loosened just enough so that the stationary bracket can be moved with a slight drag; otherwise, it will be difficult to set the points accurately. After setting the points to correct the gap, tighten the lock screw.

Distributor Lubrication

(1) Add 3 to 5 drops of SAE 10W oil to the oiler on the outside of distributor base.

(2) Lubricate the felt pad under the rotor in the top of the distributor cam with 3 to 5 drops of SAE 10W oil.

(3) Wipe all old grease from surface of the breaker cam. Apply a light film of new distributor cam lubricant MoPar Part Number 1473595. **Do not over-lubricate. Excess grease will be thrown from the distributor cam when the engine is running. If this grease strikes the breaker points, arcing and burning of the points will result.**

Testing Distributor Advance (Centrifugal Advance Curve)

Note the model number of the distributor and refer to the specifications before making this test.

Mount the distributor assembly (less cap and rotor) in a reliable stroboscope-type distributor tester and proceed with tests as follows:

NOTE: Clamp around the rib section of the distributor housing. The bottom section of the distributor housing is not a machined surface and concentricity would be affected, causing a wobble.

(1) Turn the Tach-Dwell switch to the 8 "LOBE" position and the motor switch to the correct direction of rotation. Refer to "Distributor Advance Specifications".

(2) Turn the battery switch "ON".

(3) Regulate the tester speed control to operate the distributor at 200 distributor rpm.

(4) Hold the distributor breaker plate in the full retard position and align the "0" of the distributor tester degree ring with any one of the arrow flashes.

(5) Regulate the tester speed control to operate the distributor at speeds called for under "Specifications" and observe arrow flashes opposite tester degree ring to determine degrees of advance.

(6) If the advance is not according to specifications, corrections can be made by bending the primary and secondary spring tabs to increase or decrease the spring tension. The governor spring tabs can be reached through the access hole at the breaker plate. Rotate the shaft until the proper spring and tab lines up with the access holes. Insert a screwdriver blade through the access hole and bend the spring tab toward the distributor cam to decrease spring tension and advance the spark, or away from the distributor cam to increase the spring tension and retard the spark.

NOTE: The light tension spring controls the lower end of the advance curve, and the heavier spring controls the upper end of the advance curve.

Vacuum Diaphragm Leak Test

With the distributor mounted in the distributor tester and with the vacuum unit attached to the distributor, proceed as follows:

(1) Place the thumb over the end of the vacuum pump hose and adjust the regulator control knob to give a reading 20 inches with hose closed off to be sure tester hose does not leak.

(2) Attach the vacuum pump hose to the tube on the vacuum unit. The vacuum gauge should hold on maximum vacuum obtainable if no leaks exist.

(3) Observe the breaker plate while performing the leak test to test response of the breaker plate. There should be instant response to the pull of the diaphragm, moving the plate without a drag or bind.

(4) If leakage is indicated, replace the vacuum unit assembly.

Vacuum Advance Curve

Connect the tester vacuum pump hose to the distributor vacuum advance unit and perform operations 1 through 5 under "Centrifugal Advance Curve" Then proceed as follows:

(1) Turn the tester vacuum pump "ON". Adjust the vacuum pump regulator to vacuum test specifications. See "Specifications" and observe the arrow flashes on the tester degree ring to determine the degrees of advance.

(2) If the vacuum advance is above or below specifications, replace the vacuum advance unit. retest the vacuum advance curve.

Installation

(1) Position the distributor on the engine. Align the rotor with marks previously scribed on the distributor housing.

(2) Engage the tongue of the distributor shaft with the slot in the distributor and oil pump drive gear.

NOTE: If the engine has been cranked while the distributor is removed, it will be necessary to establish the proper relationship between the distributor shaft and the No. 1 piston position as follows:

(a) Rotate the crankshaft until the number one piston is at top of the compression stroke.

(b) Rotate the rotor to the position of the number one distributor cap terminal.

(c) Lower the distributor into the opening, connect the primary lead and install the distributor cap. Make sure all high tension wires "snap" firmly in the cap towers. Install the distributor hold-down clamp screw. Tighten the screw finger tight.

NOTE: DO NOT puncture cable cap nipples or spark plug covers with a sharp tool to make contact. Use the proper adapters.

(3) Connect the secondary lead of a Power Timing Light to the No. 1 spark plug (using proper adapter). Connect the red primary lead to the positive terminal of the battery and the black primary lead to the negative battery terminal.

(4) With distributor vacumn hose disconnected start and operate the engine at idle speed. Rotate the distributor housing so that the specified timing mark and the pointer are in alignment. (Moving the distributor housing "clockwise" advances the timing and "counterclockwise" retards the timing.

(5) Tighten the distributor clamp screw after the timing has been set and recheck the timing adjustment with a power timing light.

(6) If the timing is correct, connect the vacuum hose to the distributor and remove the timing light from the engine.

20. SPARK PLUGS

Cleaning and Inspection

Remove the spark plugs. Examine the firing ends of the plugs for evidence of oil fouling, gas fouling, burned or overheating conditions.

Cleaning and Regapping

Carefully clean the spark plugs in an abrasive type cleaner. Use a pin type feeler gauge to check spark plug gap. Reset the gaps to .035 inch.

NOTE: Before setting the spark plug gap, file center electrode flat. Make adjustment by bending the ground side electrode; never bend the center electrode.

Inspect the spark plug cables, coil secondary cable, nipples and covers for cracks, wear and fraying. Test for loose terminals. When installing spark plugs, tighten to 30 foot pounds.

21. IGNITION COIL

The ignition coil is designed to operate with an external ballast resistor.

The ballast resistor is a fixed resistance in the ignition primary circuit. During low speed operation, when the primary circuit current flow is high, the ballast resistor temperature rises, increasing the resistance. This reduces the current flow, thereby prolonging ignition point life. At high speed operation, when the primary current flow is low, the ballast resistance cools off allowing more current flow, which is required for high speed operation. During starter operation, the ballast resistor is bypassed, allowing full battery voltage to the ignition primary circuit.

When testing the coil for output, include the resistor in tests. Inspect the coil for external leaks and arcing.

Test the coil according to the coil tester Manufacturer's instructions. Test the coil primary resistance. Test the ballast resistor resistance. Test the coil secondary resistance. Replace any coil and ballast resistor that does not meet specifications.

SERVICE DIAGNOSIS

IGNITION SYSTEM

Condition	Possible Cause	Correction
Burned or Pitted Distributor Points	(a) Dirt or oil on points.	(a) Replace points and adjust if the oil is on contact face, determine the cause and correct the condition.
	(b) Alternator voltage regulator setting too high.	(b) Test the alternator voltage regulator setting, adjust as necessary. Replace and adjust the distributor contact points.
	(c) Points misaligned or gap too small.	(c) Align and adjust points.
	(d) Faulty coil.	(d) Test and replace coil if necessary. Replace and adjust contact points.
	(e) Ballast resistor not in circuit.	(e) Inspect conditions, and correctly connect the coil.
	(f) Wrong condenser or faulty condenser.	(f) Test the condenser and replace if necessary. Replace and adjust points.
	(g) Faulty ignition switch.	(g) Replace the ignition switch.
	(h) Bushings or distributor shaft worn.	(h) Recondition the distributor.
	(i) Touching of points with hands during installation.	(i) Replace and adjust the contacts.
Ignition Coil Failure	(a) Alternator voltage regulator setting too high.	(a) Test the alternator voltage regulator setting and adjust as necessary. Inspect the condition of the distributor contact points.
	(b) Coil damaged by excessive heat from engine.	(b) Replace coil. Inspect the condition of the distributor contact points.
	(c) Coil case or tower cracked.	(c) Replace the coil.
	(d) Oil leak at tower.	(d) Replace the coil.
	(e) Coil tower carbon-tracked.	(e) Wipe the tower clean. Test the coil, replace if necessary.
Condenser Failure	(a) Normal fatigue.	(a) Test and replace the condenser. Inspect distributor contact points for pitting.
	(b) Damaged by excessive engine heat or moisture.	(b) Test and replace the condenser. Inspect distributor contact points for pitting.
Fouled Spark Plugs	(a) Carburetor mixture over-rich.	(a) Adjust the carburetor. Refer to Group 14 "Fuel System".
	(b) Improper gap adjustment.	(b) Set the spark plug gap to .035 inch.
	(c) Improper plug heat range.	(c) Install the correct plugs.
Burned Spark Plugs	(a) Plugs loose or too tight in the cylinder head.	(a) Replace the spark plugs: Install new gaskets. Tighten spark plugs to 30 foot-pounds torque.
	(b) Carburetor mixture too lean.	(b) Adjust the carburetor. Refer to Group 14 "Fuel System".
	(c) Improper plug heat range.	(c) Install the correct plugs.
	(d) Improper ignition timing.	(d) Adjust the ignition timing.

PART 5

LIGHTING SYSTEM

Plymouth

The dual headlamp system on Plymouth models consists of four sealed beam headlamps.

The two outboard lamps are of the two filament type for low and high beam and are marked by a numeral 2 molded in the lamp lens.

The lamps cannot be installed wrong as the mounting lugs for the number one (1) and number two (2) lamps are offset at different angles.

The number 1 lamp provides the high intensity "reach" down the highway and the off focus filament in the number 2 lamp provides the "body" light which illuminates the side of the road, ditches, etc.

Valiant

The single beam system on Valiant models consists of two sealed beam headlamps.

The lamps are the two filament type for low and high beam and are marked by a number 2 molded in the lamp lens.

The low beam provides the "body" light which illuminates the side of the road, ditches, etc.

The high beam provides the high intensity "reach" down the highway.

1. AIMING THE HEADLAMPS

Pre-Aiming Instructions

(1) Test the dimmer switch operation.

(2) Test the high beam indicator—indicates the **high** beam is in operation when lighted.

(3) Inspect for badly rusted or faulty headlamp assemblies. These must be corrected before a satisfactory adjustment can be made.

(4) Place the vehicle on a level floor.

(5) Adjust the front suspension height as necessary.

(6) Inspect tire inflation.

(7) Rock the vehicle sideways to allow the vehicle to assume its normal position.

(8) If the gasoline tank is not full, place a weight in the trunk of vehicle to simulate the weight of a full tank (6¼ pounds per gallon).

(9) There should be no other load in the vehicle other than the driver or a substituted weight of approximately 150 pounds placed in the driver's position.

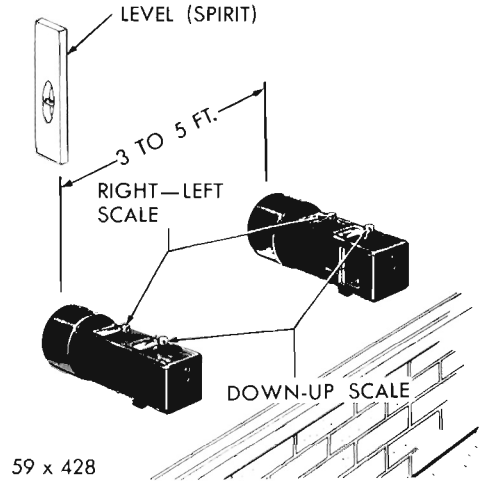


Fig. 1—Testing Aimer for Calibration

(10) Remove the headlamp front trim panel. Do not remove the seal beam retainer rims.

(11) Thoroughly clean the headlamp lenses.

2. AIMER CALIBRATION

Testing and Adjusting (Fig. 1)

(1) Using a carpenter or a stone mason level of known accuracy, locate a true vertical plate glass window or smooth surface.

(2) Set the **DOWN-UP** pointer on **DOWN 2.**

(3) Set the **RIGHT-LEFT** pointer and the floor level compensator at "O".

(4) Secure the aimers to the glass or smooth surface three to five feet apart so split image targets can be located in the viewing ports.

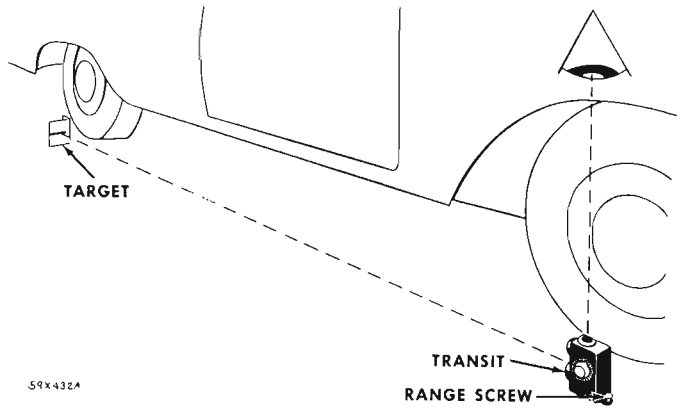


Fig. 2—Determining Slope of Floor

(5) If the bubble is centered in the glass dial, vertical calibration is correct. If the bubble is not centered, make the **DOWN-UP** adjustment by rotating the level adjusting screw until the bubble is centered in the spirit level.

(6) The horizontal aim is correct if the targets on opposite aimers are aligned in the viewing ports. If the targets are not aligned in the viewing ports, rotate the mirror adjusting screw until the target split image becomes aligned.

3. COMPENSATING AND MOUNTING THE AIMERS

Determining the Slope of Floor

(1) Place the transit on the floor in line with the vertical centerline of the right front wheel (Fig. 2). Place the split image target in like position at the right rear wheel.

(2) Adjust the range screw on the transit until the target split image coincides or merges into one unbroken line.

NOTE: Make sure that the line of sight is perpendicular from the eye to the viewing port of the transit and that the target image is centered in viewing port of transit.

(3) Turn the dial on the side of the transit until the bubble in the spirit level is centered.

(4) When the bubble is centered, note "plus" or "minus" reading on the compensator scale. This figure indicates the degree of slope of the floor and must be transferred to each aimer.

(5) With a screw driver, turn the adjusting slot of the floor level compensator in each aimer, until the correct plus or minus figure (or fractional part) appears in the proper window, as shown in Figure 3.



Fig. 3—Adjusting Floor Level Compensator in the Aimers

4. MOUNTING AND ADJUSTING THE AIMERS

(1) While holding an aimer in alignment with the lens of one **outboard** headlamp, bring aimer up to and against headlamp lens.

NOTE: Make certain that the headlamp lens pads are making full contact with the aimer mounting flange and that the aimer target is facing inboard.

(2) Push the release lever forward (to expel air from suction cup) and while holding the aimer firmly against the headlamp aiming pads, slowly pull the release lever back until the spring lock engages in the slot, as shown in Figure 4.

(3) Mount the second aimer on the other outboard headlamp, in the same manner.

(4) On each aimer, set the pointer to numeral 2 the **DOWN** side of the **DOWN-UP** scale.

(5) On each aimer position the pointer, of the **RIGHT-LEFT** scale, at **2-RIGHT.**

5. MEASURING HEADLAMP AIM

Horizontal Test

Turn the RIGHT-LEFT scale knob until the split image is in alignment. If the **RIGHT** or **LEFT** PORTION of scale exceeds the following values, the lamps should be aimed.

Values given represent inches at 25 feet.

	Right	Left
No. 1 Unit	4	4
No. 2 Unit	4	4

Vertical Test

Turn **DOWN-UP** scale knob until the spirit level is centered. If **Down** or **Up** portion of the scale exceeds the following values, the lamps should be aimed.

	Down	Up
No. 1 Unit	½ to 3½	0
No. 2 Unit	½ to 3½	0

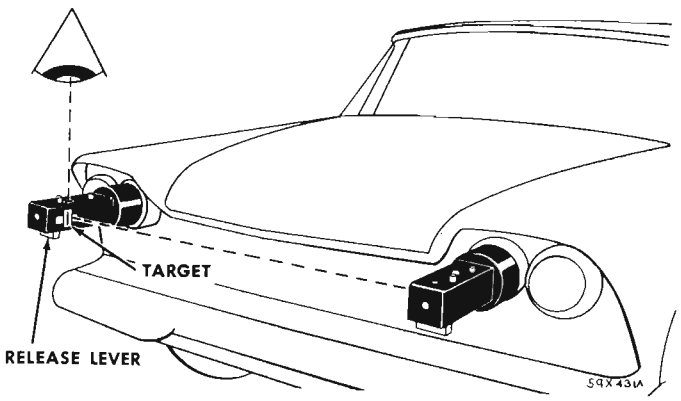


Fig. 4—Mounting and Adjusting Aimers

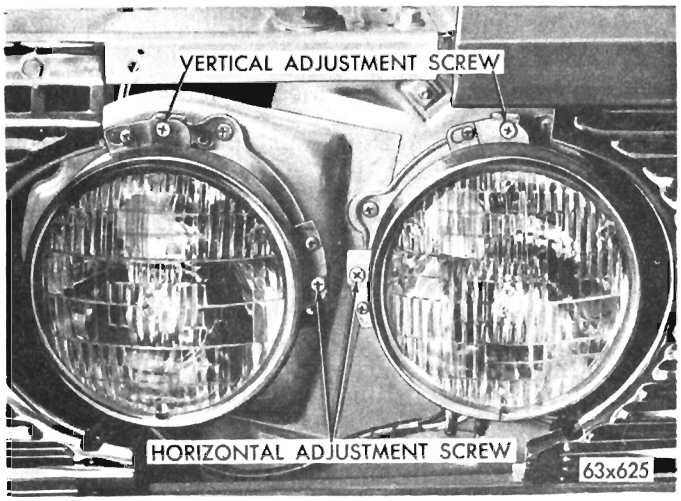


Fig. 5—Headlamp Adjustment Points (Plymouth)

6. ADJUSTING THE HEADLAMPS

Horizontal Adjustment

(1) With the pointer of RIGHT-LEFT scale still set at **2-RIGHT,** sight through the aimer viewing port.

NOTE: Make sure that the line of sight is perpendicular from the eye to the viewing port of the aimer and that the target image is centered in the viewing port of the aimer.

(2) While sighting through the viewing port of the aimer, turn the horizontal adjusting screw on the headlamp until the split target image line merges into one unbroken line. To remove backlash, be sure to make a final adjustment by turning headlamp horizontal adjusting screw in a clockwise direction, as shown in Figures 5 or 6.

(3) Make the horizontal adjustment on the other **outboard** headlamp in the same manner.

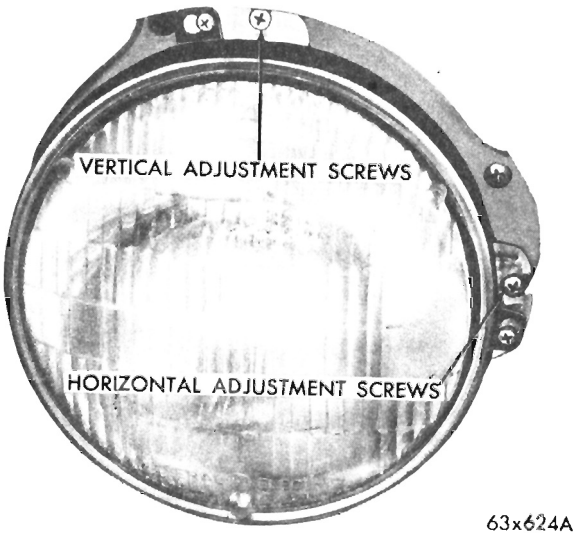


Fig. 6—Headlamp Adjustment Points (Valiant)

Vertical Adjustment

(1) Turn the vertical adjusting screw on the headlamp in a counterclockwise direction to bring the bubble of the spirit level on the aimer to the vehicle side of center. Use care to avoid disturbing the installed position of the aimers. Then turn the screw clockwise until the bubble is centered for correct aim and elimination of backlash.

(2) Make the vertical adjustment on the other **outboard** unit in the same manner.

(3) Inspect the target alignment on each side and readjust the horizontal aim, if necessary.

Proceed to adjust the inboard units by following the instruction as outlined for the outboard headlamps Paragraph 4. Install headlamp trim panels.

NOTE: Remove the aimers by releasing the spring lock at the rear (bottom) of the aimer and pushing the release lever forward. Do not attempt to remove the aimers by pulling them away from the headlamp lens—slide the suction cup downward and away from the lens.

7. HEADLAMP SEALED-BEAM REPLACEMENT (All Models)

Lens, filament and reflector are sealed into one unit which can be removed as follows:

(1) Remove the screws from the headlamp panel and remove the panel.

(2) Remove screws from interior retaining ring, and remove the ring. **Do not disturb the headlamp aimer screws.**

(3) Pull out the sealed-beam unit and unplug the connector, pulling it straight off.

(4) Install a new sealed-beam unit.

(5) Install the unit retaining ring and headlamp panel.

(6) Aim the headlamp.

8. VISUAL HEADLAMP ADJUSTMENT (Without Aimers) SINGLE BEAM—VALIANT

Place the vehicle on a known level floor 25 feet from the aiming screen or light colored wall.

Four lines are required on the screen or wall: (See Fig. 7)

(a) A horizontal line at the level of the centers of the lamplamps.

(b) A center vertical line which must be lined up with the center of the hood.

(c) A vertical line on the left of the screen or wall in line with the center line of the left headlamp.

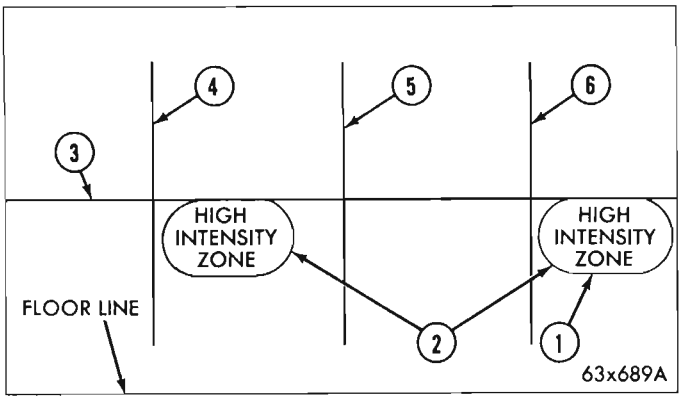


Fig. 7—Single Beam Adjustment Pattern

(d) A vertical line on the right of the screen or wall in line with the center line of the right headlamp.

Remove the headlamp door. Adjust the top adjusting screw for vertical adjustment, adjust the side screw for horizontal adjustment. (See Fig. 6).

Refer to Figure 7 and adjust the headlamp as follows:

1. Lower beam pattern of the right headlamp.
2. Lower beam pattern of both headlamps.
3. Horizontal line at the level of the headlamp centers.
4. Vertical line in line with the center of the left headlamp.
5. Vertical line in line with the center of the hood.
6. Vertical line in line with the center of the right headlamp.

SERVICE DIAGNOSIS

HEADLAMPS

Condition	Possible Cause	Correction
Headlamps Dim (engine idling or shut off)	(a) Partly discharged battery.	(a) Charge the battery.
	(b) Faulty cells in battery.	(b) Replace the battery.
	(c) High resistance in headlamp circuit.	(c) Test the headlamp circuit including ground connection. Make necessary repairs.
	(d) Faulty sealed beam units.	(d) Replace sealed beam units.
Headlamps Dim (engine running above idle)	(a) High resistance in headlamp circuit.	(a) Test the headlamp circuit including ground connection. Make necessary repairs.
	(b) Faulty sealed beam units.	(b) Replace sealed beam units.
	(c) Faulty voltage regulator.	(c) Test the voltage regulator and alternator. Make necessary repairs.
Lamps Flicker	(a) Loose connections or damaged wires in headlamp circuit.	(a) Tighten the connections and inspect for damaged wiring.
	(b) Headlamp wiring insulation damaged producing momentary.	(b) Test headlamp wiring and replace or tape damaged wires.

SERVICE DIAGNOSIS— (Continued)

HEADLAMPS

Condition	Possible Cause	Correction
Lamps Burn Out Frequently	(a) High voltage regulator setting.	(a) Adjust the voltage regulator.
	(b) Loose connections in headlamp circuit.	(b) Inspect the circuit for loose connections.
Lamps Will Not Light	(a) Discharged battery.	(a) Recharge the battery and correct cause.
	(b) Loose connections in headlamp circuit.	(b) Tighten the connections.
	(c) Burned out lamps.	(c) Replace the bulbs or sealed beam unit.
	(d) Open or corroded contacts in headlamp switch.	(d) Replace the headlamp switch.
	(e) Open or corroded contact in dimmer switch.	(e) Replace the dimmer switch.

PART 6
INSTRUMENTS — INDICATORS

INSTRUMENTS

The instrument cluster assembly is attached to the instrument panel by four cross-recessed screws. The cluster contains the speedometer, fuel gauge, temperature gauge, alternator (ammeter), oil pressure warning light and clock (if so equipped). The instruments and lamps are attached to a printed circuit board in which are imbedded the electrical circuits (conductors) in the form of die cut, copper foil strips.

The printed circuit completes the circuit to the fuel gauge, temperature gauge, voltage limiter and instrument lamps. The screws attaching the printed circuit to the cluster base serve as a ground for the instrument lamps and the voltage limiter.

With the exception of the leads to the alternator (ammeter) and clock, all wiring to the cluster is connected through a plug type multi-connector to the male connector pins on the printed circuit board which is mounted to the back of the instrument cluster assembly. The female multi-connector is a push type with a master locator pin.

The fuel and temperature gauges are the thermal type. The gauges operate on a principle of a constant voltage being applied and are sensitive to changes in fuel level or temperature.

SERVICE PROCEDURES

1. VOLTAGE LIMITER

Plymouth

Constant voltage is provided to the gauges through the use of a voltage limiter mounted on the back of the instrument cluster printed circuit board and is connected in parallel to the gauges and provides the same regulated voltage to the gauges.

Valiant

Constant voltage is provided through a voltage limiter contained inside the fuel gauge. The voltage limiter is connected in parallel to the gauges and provides the same regulated voltage to the gauges.

Testing the Voltage Limiter—in the Vehicle

A quick test to determine if the voltage limiter is operating is to connect one lead of a voltmeter or test lamp to the temperature sending unit and the other lead to a good ground; leave the sending unit lead wire attached to the sending unit.

Turn the ignition switch to the "on" position. A fluctuating voltmeter or a flashing lamp indicates the voltage limiter is operating.

Testing the Voltage Limiter—Instrument Cluster Removed

Plymouth

Connect a jumper wire from the positive post of a 12 volt test battery to the voltage limiter input terminal. Connect another jumper wire from the battery negative post to the voltage limiter case (ground).

Connect the negative lead of a voltmeter to the battery negative post. Touch the positive lead of the voltmeter to the input terminal of the voltage limiter. A reading of 12 volts should be shown on the voltmeter.

Touch the positive lead of the voltmeter to the output terminal of the voltage limiter. A fluctuating reading between 0 and 7 volts should be shown on the voltmeter. Any other reading indicates the voltage limiter is not functioning properly and should be repleaced

Valiant

Connect a jumper wire from the positive post of a 12 volt test battery to the "I" terminal of the fuel gauge. Connect another jumper wire from the battery negative post to the fuel gauge case (ground).

Connect the negative lead of a voltmeter to the battery negative post. Touch the positive lead of the voltmeter to the "I" terminal of the fuel gauge. A reading of 12 volts should be shown on the voltmeter. Touch the positive lead of the voltmeter to the "A" terminal of the fuel gauge. A fluctuating reading between 0 and 7 volts should be shown on the voltmeter. The same fluctuating reading should be shown at the "S" terminal of the fuel gauge. Any other readings indicate the voltage limiter is not functioning properly and the fuel gauge should be replaced.

2. FUEL LEVEL INDICATING SYSTEM (Figs. 1 and 2)

Turning the ignition key on, connects the system to the battery or charging system voltage. The function of the voltage limiter is to regulate this input voltage from the battery or charging system to a con-

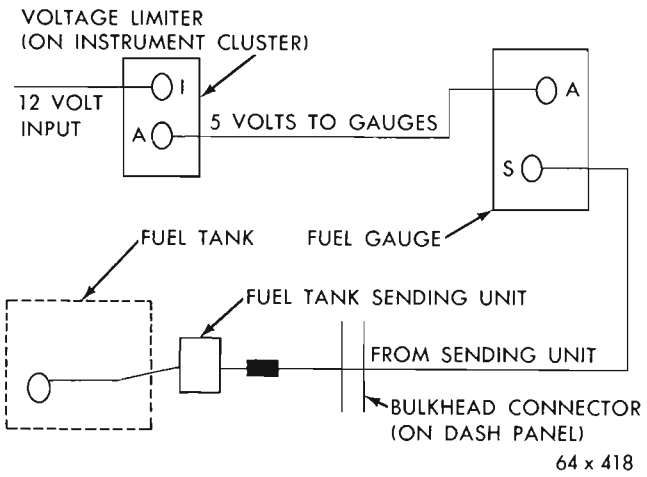


Fig. 1—Fuel Level Indicating System (Plymouth)

stant voltage of approximately 5 volts D.C.

The effect of this constant voltage supply is to cause the balance of the system to be sensitive to changes in the value of resistance at the tank unit only.

A float arm is hinged to allow the float to raise or lower dependent on the fuel level. The float connects to a variable resistance that provides a change in the resistance with any up or down movement of the float through a wiping contact in the gauge body.

When the fuel level is low or if the fuel tank is empty, the resistance is increased which decreases the current flow and consequently positions the instrument panel gauge pointer to low or empty.

When the tank is full, the float level is at the top, the minimum resistance is in the circuit and the flow of current in the circuit is high. The instrument panel gauge pointer will be moved across the dial to indicate a full tank.

Testing Fuel Indicating System in the Vehicle

Raise the vehicle on a lift. Disconnect the terminal

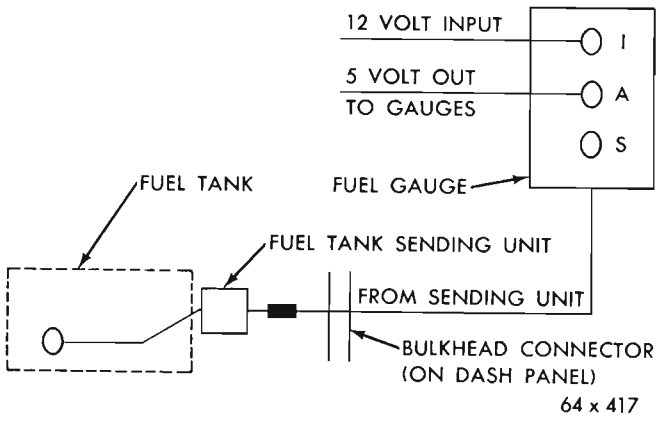


Fig. 2—Fuel Level Indicating System (Valiant)

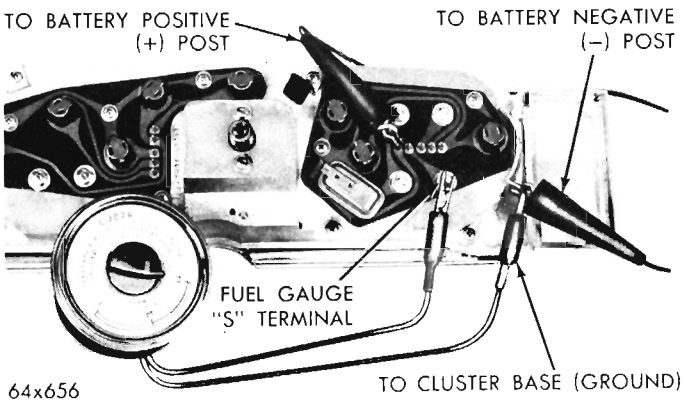


Fig. 3—Testing Fuel Gauge (Tool C-3826) (Plymouth)

from the tank unit. Attach one lead of the Gauge Tester (C-3826) to the disconnected terminal. Connect the other lead of the tester to a good ground.

With the ignition switch turned **on** and gauge tester in the "L" position, the fuel gauge should show "E" or minus $\frac{3}{32}$ inch.

NOTE: This tolerance permits a small reserve of fuel at the "E" position.

With the gauge tester in the "M" position, the fuel gauge should slowly advance to the ½ position, plus or minus $\frac{1}{16}$ inch. With the gauge tester in the "H" position the fuel gauge should advance to "F", plus or minus $\frac{3}{32}$ inch.

Should the gauge fail to respond to the above tests, indications are of possible loose connections, broken wire, faulty printed circuit or a defective fuel gauge. The instrument cluster should be removed for further tests. See "Instrument Cluster", Paragraphs 6 and 7.

Testing Fuel Gauge—Instrument Cluster Removed (Figs. 3 and 4)

Place the instrument cluster on a padded service

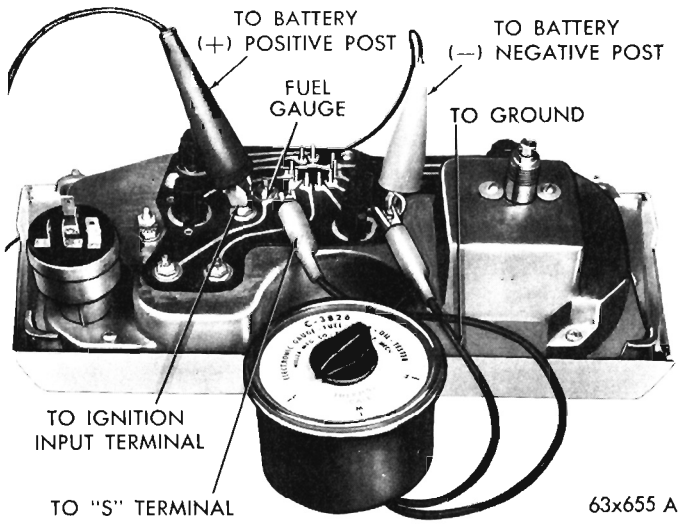


Fig. 4—Testing Fuel Gauge (Tool C-3826) (Valiant)

bench to protect the cluster finish.

The gauges in the instrument cluster can be tested with a fully charged 12 volt battery and Gauge Tester Tool C-3826.

To prevent a possible error that might result in burning out the gauges the following test procedures should be closely followed.

CAUTION: A direct connection from a 12 volt battery to the gauges will burn them out. A short circuit to the printed circuitry will burn it out.

(1) On Plymouth models insulate the pins at both sides of the ignition input pin of the printed circuit. Connect a jumper wire to the voltage limiter input terminal on Plymouth models or to the ignition input terminal of the fuel gauge on Valiant models. Connect the other end of the jumper wire to the positive post (+) of a 12 volt test battery.

(2) Connect a jumper wire from the negative (—) post of the battery to the instrument cluster base (ground).

(3) Connect one lead from Tester Tool C-3826 to the fuel gauge "S" terminal.

With the gauge tester in the "L" position, the fuel gauge should show "E" or minus $\frac{3}{32}$ inch.

NOTE: The minus tolerance provides a small fuel reserve when the gauge is on "E" position.

With the gauge tester on "M", the fuel gauge should slowly advance to the ½ position. With the gauge tester on "H" the fuel gauge should show "F" plus or minus $\frac{3}{32}$ inch. If the gauge does not perform as above test for an open printed circuit or replace the fuel gauge.

3. TEMPERATURE INDICATING SYSTEM (Fig. 5)

The operation of the temperature indicating system is identical in operation with the fuel system with the exception of the method of varying the resistance of the sending unit. In this system the resistance varies in direct relation to the temperature of the coolant.

Any change in the coolant temperature causes a like change in the resistor incorporated in the engine sending unit.

When the engine is cold the resistance of the disc in the temperature sending unit is high and a low temperature will be indicated.

As the engine temperature increases, the resistance of the temperature sending unit disc starts to decrease. A resultant increase in the current flow will occur causing the gauge pointer to indicate the increase in engine temperature.

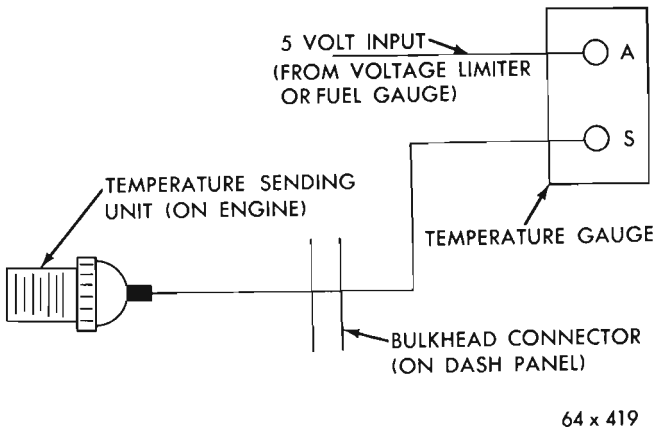


Fig. 5—Temperature Indicating System

Testing the Temperature Indicating System in the Vehicle

Disconnect the terminal from the temperature sending unit on the engine. Connect one test lead of tester C-3826 to the terminal and the other test lead to a good ground. Place the pointer of the gauge tester on the "L" position and turn the ignition switch to **"on"**. The temperature gauge should show "C" plus or minus ⅛ inch.

NOTE: Thermal gauges are slow in operation. Allow time for gauge to heat up.

Place the pointer on the tester on the "M" position and the temperature gauge should advance to the driving range or ⅛ position of the dial. Place the pointer of the tester in the "H" position and the gauge should advance to the "H" position of the dial. Should the gauge respond to the above tests but not operate when the terminal is attached to the send-

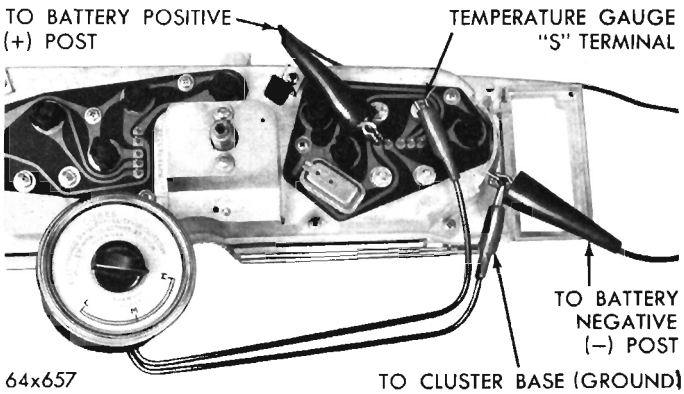


Fig. 6—Testing Temperature Gauge (Tool C-3826) (Plymouth)

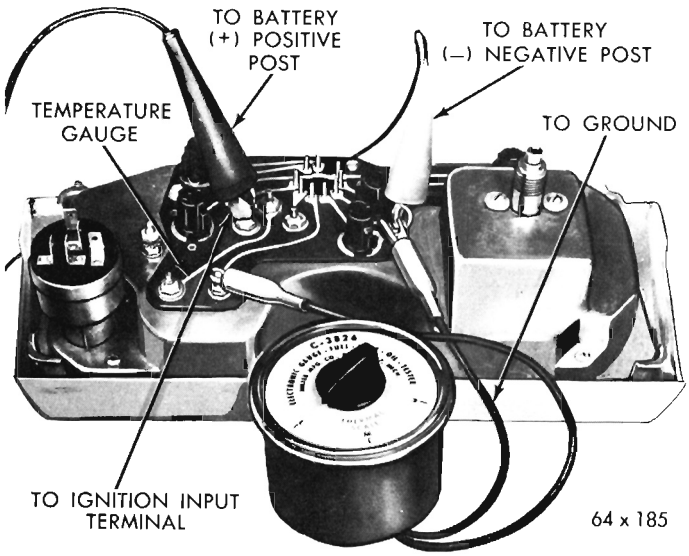


Fig. 7—Testing Temperature Gauge (Tool C-3826) (Valiant)

ing unit, indications are of a defective sending unit and it should be replaced.

Should the gauge fail to respond to the above tests, indications are of possible loose connections, broken wire printed circuit, or defective gauge. The instrument cluster should be removed for further inspection. See "Instrument Cluster". Paragraphs 6 and 7.

Testing Temperature Gauge—Instrument Cluster Removed (Figs. 6 and 7)

The temperature gauge is tested in the same manner as the fuel gauge with the exception that Tester C-3826 is connected to the temperature gauge "S" terminal.

With the gauge tester on "L" position, the temperature gauge should show "C" or cold. With the gauge tester on "M" position, the temperature gauge should show ½ of the operating scale of the dial. With the gauge tester on the "H" position, the temperature gauge tester should show "H". If the gauge does not respond to the above tests, test for an open printed circuit or replace the temperature gauge.

4. OIL PRESSURE WARNING LAMP

To test the oil pressure warning lamp, remove the terminal from the oil pressure sending unit. Connect one lead of the gauge tester to the terminal and the other test lead to a good ground.

With the ignition switch in the "on" position and the gauge tester in the "L" position, the warning lamp should not light. With the gauge tester in the "M" position, the warning lamp should show a dull glow. With the gauge tester in the "H" position, the lamp should show full brilliance.

Should the oil pressure warning lamp fail to respond to the above tests, indications are of possible loose connections, broken wire, or a burned out lamp.

5. INSTRUMENT CLUSTER BULB REPLACEMENT

All bulbs in the instrument cluster are retained by sockets which plug-in into the printed circuit. The bulbs can be reached from under the instrument panel. To remove the socket turn it ¼ turn counterclockwise and pull out. For replacement bulb number see the "Bulb Chart" specifications.

6. INSTRUMENT CLUSTER—PLYMOUTH

NOTE: Disconnect the battery negative cable before servicing the cluster.

Removal

(1) Disconnect the speedometer cable from the speedometer.

(2) Remove the four mounting screws from the steering column opening cover in the instrument panel.

(3) Remove the mounting screw on steering column strap and the two screws on the steering column brace to allow steering column to drop.

(4) Remove the transmission control sprag arm knob.

(5) Remove the three screws from the transmission control bezel and remove the bezel.

(6) Remove the heater temperature control knob.

(7) Remove the two screws from the heater control bezel and remove the bezel.

(8) Remove the four instrument cluster mounting screws.

(9) Roll the cluster out to allow removal of the wires and cables to the cluster.

(10) Disconnect the bowden cable from the heater control.

(11) Remove the two printed circuit plugs and the alternator gauge wires.

(12) Disconnect the heater switch vacuum hoses and the two wires from the heater control.

(13) Remove the instrument cluster.

Installation

(1) Position the instrument cluster in front of the cluster opening in the instrument panel and connect the two printed circuit plugs, alternator gauge wires, heater switch vacuum hoses, heater bowden cable, and the two wires to the heater control switch.

(2) Roll the cluster into the instrument panel opening and install the four mounting screws.

(3) Install the transmission and heater control push button control bezels.

(4) Install the transmission control sprag and temperature control lever knobs.

(5) Position the steering column to the steering column brace and install the column brace strap.

(6) Install steering column opening cover on the instrument panel.

(7) Connect the speedometer cable to the speedometer.

(8) Connect the battery negative cable.

7. INSTRUMENT CLUSTER—VALIANT

Removal

NOTE: The instruments and printed circuit can be serviced after the cluster is removed from the instrument panel.

CAUTION: Remove the battery cable at the battery negative terminal before removing the cluster.

(1) Cover the steering column jacket tube area between the steering wheel and the instrument panel with masking tape to avoid scratching the paint finish.

(2) Loosen the steering column clamp screws several turns to lower the steering column slightly.

(3) Reach up under the instrument panel and disconnect the speedometer cable at the speedometer.

(4) Remove the four screws visible on the face of the cluster. Tilt the cluster downward and to the right and disconnect the lead wires to the ammeter, the ignition switch multi-connector and the printed circuit multi-connector. Remove the cluster to the work bench for testing or replacing the instruments or printed circuit.

Installation

CAUTION: The battery cable to the battery negative terminal must be disconnected before installation of cluster.

(1) Rest the cluster bezel face on the protected area of the steering column jacket between the steering wheel and the instrument panel.

(2) Connect the lead wires to the ignition switch, printed circuit, and ammeter. Tighten all connections securely to insure proper electrical contact.

(3) Roll the cluster into position in the instrument panel and install the four cluster attaching screws.

(4) Reach under the instrument panel and connect the speedometer cable to the speedometer.

(5) Tighten the steering column clamp screws.

(6) Connect the battery cable to the battery negative terminal.

(7) Test the cluster instrument operation.

8. PRINTED CIRCUIT BOARD TESTING (Instrument Cluster Removed)

The printed circuit board should be visually inspected first to determine if a conductor is open. If there is no visual break, ground the instrument cluster with a jumper wire from the cluster base to a good ground.

(1) Test the individual printed circuit plug connector with a test lamp to determine if voltage is available at that point.

(2) If voltage is available, substitute a good lamp or gauge in the inoperative circuit.

(3) Connect the plug connector to the printed circuit board and connect a test lamp prod to the input side of the lamp opening or gauge.

(4) If voltage is available at the input side of the gauge or lamp, test for continuity at the ground terminal. If an open circuit is detected in the conductor, the printed circuit board must be replaced.

9. CLUSTER COMPONENTS

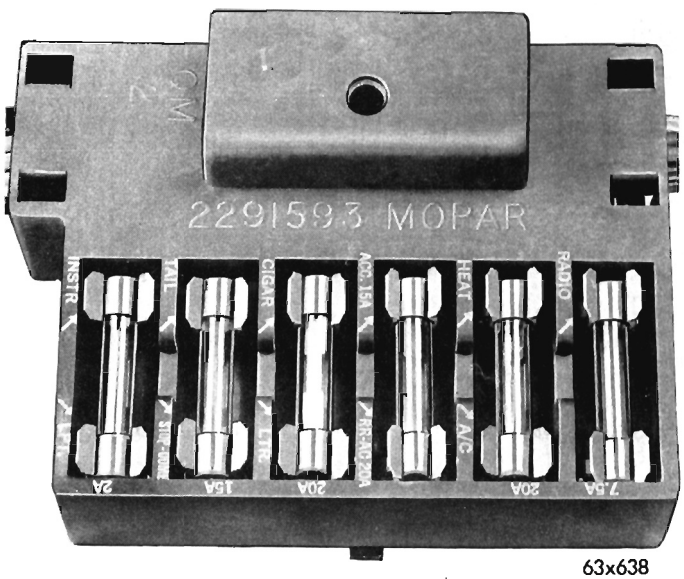
Disassembly

(1) Remove the clock reset knob (if so equipped).

(2) Place the cluster assembly on a padded surface with the bezel face down.

(3) Remove the screws attaching the bezel assembly to the cluster base and remove the bezel.

(4) Remove the attaching nuts or screws for removal of the desired gauge or speedometer.



63x638

Fig. 8—Fuse Block

Assembly

When installing the instruments into the printed circuit, take special note of alignment.

Position the printed circuit on the cluster base and install the attaching screws.

Install gauges and speedometer.

Position the cluster base on the cluster bezel and install the attaching screws.

10. FUSE BLOCK (Fig. 8)

The fuse block is located at approximately the center, forward edge of the instrument panel and is retained to the instrument panel lower reinforcement by a self tapping screw.

In the fuse block are mounted the radio, cigar lighter, air-conditioner or heater, tail-stop-dome light and accessory fuses. The fuse capacity is printed on the fuse block as an aid to replacement requirements.

11. CIRCUIT BREAKERS

As a safety precaution, circuit breakers are used for the headlamps and wiper circuits. They insure that these essential services will continue to function if an intermittent short circuit occurs. Use only identical type and amperage value circuit breakers as replacements for service.

SERVICE DIAGNOSIS

INSTRUMENTS

Condition	Possible Cause	Correction
All Gauges Read High ("against the peg") After Ignition Switch is Turned "ON"	(a) Faulty constant voltage limiter (stuck points or an open heater coil).	(a) Test the voltage limiter.
	(b) Cluster not properly grounded to panel.	(b) Tighten cluster mounting screws.
Gauge Pointers Do Not Move When Ignition Switch is Turned "ON"	(a) Faulty constant voltage limiter or an open circuit on battery side (input of limiter).	(a) Test voltage limiter. Test wiring, repair or replace as necessary.
Temperature Gauge Indicates Normal Operation. But the Fuel Gauge Indicates a Higher or Lower Fuel Level than Actually Exists	(a) Fuel tank sending unit or instrument panel fuel gauge is faulty.	(a) Test sending unit and gauge.
	(b) Fuel tank is improperly grounded.	(b) Test fuel tank for a good ground. **NOTE: Testing the system with the tank sending unit positioned for both "empty" and "full" is usually sufficient to determine the calibration in the range between these positions.**
Fuel Gauge Indicates Correctly But Temperature Gauge Indicates Higher or Lower Temperature than Actual Engine Temperature	(a) Faulty instrument panel temperature gauge, wiring or faulty temperature sending unit in engine.	(a) Test wiring, repair or replace as necessary. Test gauge and sending unit.

SERVICE DIAGNOSIS—(Continued)

INSTRUMENTS

Condition	Possible Cause	Correction
Erratic Temperature Gauge Operation	(a) Loose or dirty electrical connections.	(a) Clean and tighten all electrical connections and test the gauge operation.
Erratic Operation of Fuel Gauge	(a) Loose or dirty electrical connections or faulty fuel tank sending unit.	(a) Test the fuel gauge sending unit, and proceed as follows: (1) Clean and tighten all electrical connections. (2) Make sure that the fuel tank sending unit is grounded to the tank and that the tank is grounded to the frame.

DIRECTIONAL INDICATOR SYSTEM

SERVICE PROCEDURES

1. DIRECTIONAL INDICATOR SWITCH (Plymouth)

Removal

(1) Disconnect the battery cable at the battery negative terminal.

(2) Compress and turn the horn button ¼ turn counterclockwise to release the button from the retainer. On models equipped with a horn blowing ring remove the 2 attaching screws from the underside of the steering wheel.

(3) Disconnect the horn wire at the horn blowing switch.

(4) Remove the three (3) screws and insulators attaching the horn ring and horn blowing switch to the steering column. Remove the horn ring and switch.

(5) Loosen the steering wheel nut several turns and install the Steering Wheel Puller Tool C-3428 and remove the steering wheel nut and steering wheel.

(6) Remove the screw attaching the directional switch lever to the directional switch and remove the lever.

(7) Disconnect the directional switch wiring at the steering column jacket tube below the instrument panel.

NOTE: Attach a piece of string or fine wire to the directional switch wiring before removing the switch from the steering column. When the switch is removed leave the string or wire in the steering column jacket tube as an aid to replacement of the wiring.

(8) Remove the screws attaching the directional switch to the steering column and remove the switch from the top of the steering column.

Installation

(1) Attach the string or wire, (that was left in the steering column jacket tube during removal), to the directional switch wiring and carefully pull the string or wire down through the column jacket tube until the directional switch is positioned in the steering column jacket tube. Install the attaching screws and connect all wire connections.

(2) Install the directional switch lever.

(3) Install the steering wheel and the steering wheel nut. Tighten to 24 foot-pounds torque. Test the operation of the cancelling lever.

(4) Install the horn blowing switch, horn ring, insulators and attaching screws. Connect the horn wire at the horn blowing switch.

(5) Install the horn button by compressing and turning ¼ turn clockwise to lock the horn button on the retainer. On models equipped with a horn blowing ring install the 2 attaching screws from the underside of the steering wheel.

(6) Connect the battery cable at the battery negative terminal.

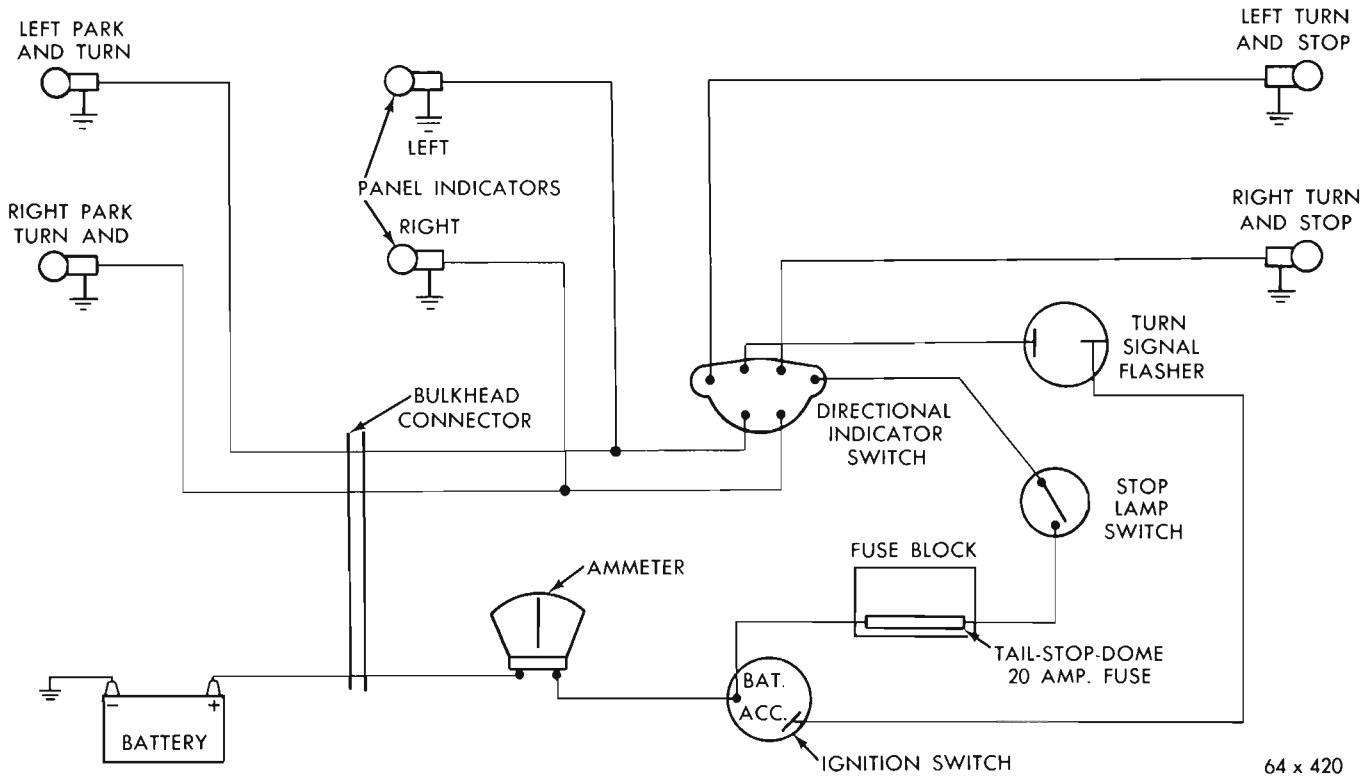


Fig. 1—Directional Indicator Wiring Diagram (Plymouth)

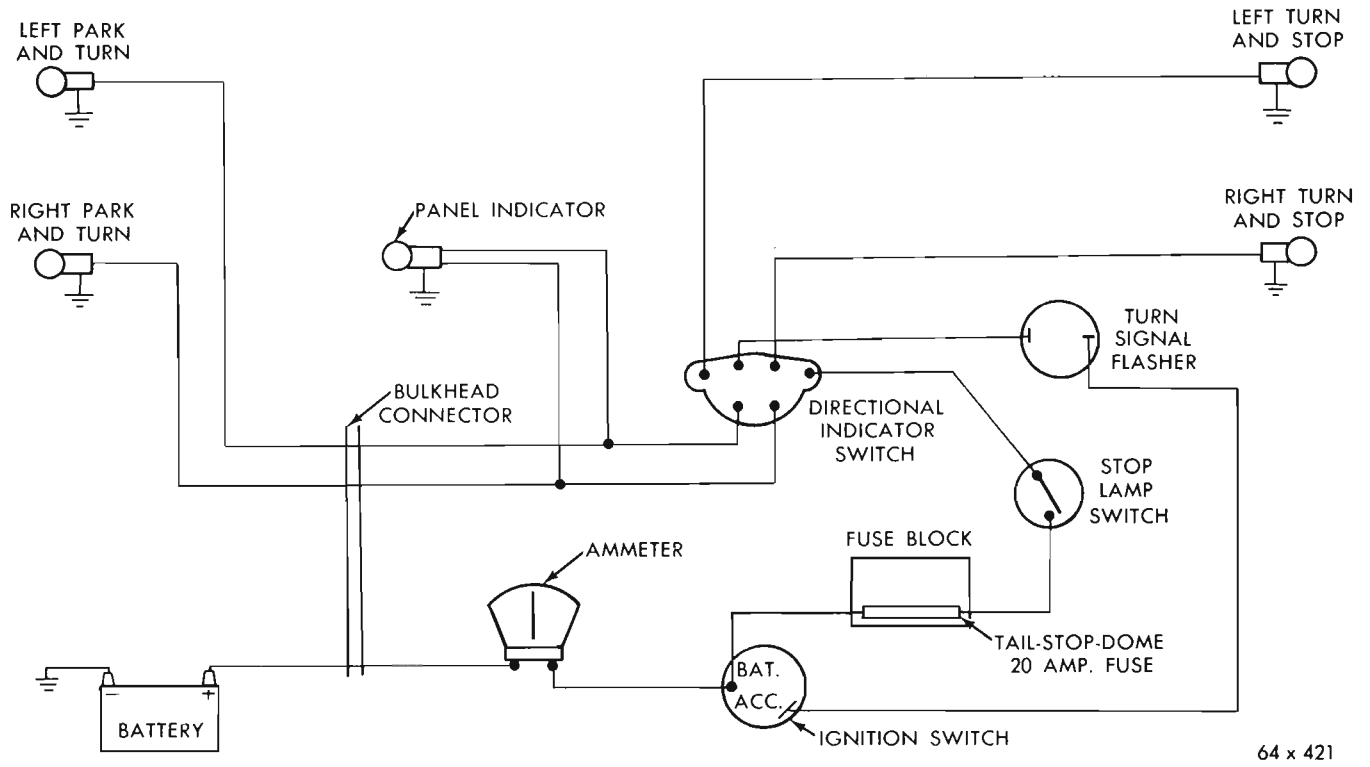


Fig. 2—Directional Indicator Wiring Diagram (Valiant)

2. DIRECTIONAL INDICATOR SWITCH (Valiant)

Removal

(1) Disconnect the battery cable at the battery negative terminal.

(2) Pry the cap off of the horn button with a screwdriver using care to avoid damage to the cap.

(3) Disconnect the horn wire at the horn blowing switch.

(4) Remove the three (3) screws and insulators attaching the horn ring and horn blowing switch to the steering column. Remove the horn ring and switch.

(5) Loosen the steering wheel nut several turns and install the steering wheel puller Tool C-3428 and remove the steering wheel nut and steering wheel.

(6) Remove the screw attaching the directional switch lever to the directional switch and remove the lever.

(7) Disconnect the directional switch wiring at the steering column jacket tube below the instrument panel.

NOTE: Attach a piece of string or fine wire to the directional switch wiring before removing the switch from the steering column. When the switch is removed leave the string or wire in the steering column jacket tube as an aid to replacement of the wiring.

(8) Remove the screws attaching the directional switch to the steering column and remove the switch from the top of the steering column.

Installation

(1) Attach the string or wire (that was left in the steering column jacket tube during removal), to the directional switch wiring and carefully pull the string or wire down through the column jacket tube until the directional switch is positioned in the steering column jacket tube. Install the attaching screws and connect all wire connections.

(2) Install the directional switch lever.

(3) Install the steering wheel and the steering wheel nut, tighten to 24 foot-pounds torque. Test the operation of the cancelling lever.

(4) Install the horn blowing switch, horn ring, insulators and attaching screws. Connect the horn wire at the horn blowing switch.

(5) Press the cap onto the horn blowing button.

(6) Connect the battery cable at the battery negative terminal.

3. WIRING DIAGRAMS

For the wiring diagrams of the directional indicator systems refer to Figure 1 for Plymouth models and Figure 2 for Valiant models.

SERVICE DIAGNOSIS

DIRECTIONAL INDICATORS

Condition	Possible Cause	Correction
External Lamps Operate Normally, No Indication on Instrument Cluster	(a) Faulty pilot bulb in instrument cluster.	(a) Replace bulb.
System Does Not Flash	(a) Faulty flasher unit. (b) Faulty external bulb. (c) Faulty contact in switch.	(a) Replace flasher. (b) Replace faulty bulb. (c) Replace switch.
System Does Not Cancel After Completion of Turn	(a) Broken or loose cancelling finger. (b) Improperly aligned cancelling finger. (c) Broken or faulty switch.	(a) Replace cancelling finger. (b) Align cancelling finger properly. (c) Replace switch.

SERVICE DIAGNOSIS—(Continued)

DIRECTIONAL INDICATORS

Condition	Possible Cause	Correction
Entire System Does Not Operate	(a) Open circuit in feed wire to switch. (b) Faulty fuse.	(a) Test wiring circuits. Refer to "Wiring Diagrams". (b) Replace fuse.
Pilot Lamp Illuminates Brightly, External Lamps Glows Dimly with No Flash	(a) Loose or corroded external lamp ground connection.	(a) Clean and tighten ground connection.

PART 7

WINDSHIELD WIPERS—HORNS

The single speed wiper motor shown in Figures 1 and 2, is connected to the wiper switch and from the wiper switch "B" terminal to the "ACC' accessory terminal of the ignition-starter switch so that the wiper motor is actuated only when the ignition switch key is turned to the right or left position. The variable speed wiper motor is connected from the wiper motor to the wiper switch and then through a circuit breaker to the ignition switch. Refer to the "Wiring Diagrams". The single speed wiper motor is protected by a circuit breaker built into the wiper switch. The variable speed motor is protected by a circuit breaker which is attached to the "B" terminal of the switch.

The variable speed system has a depressed parking feature (against windshield mouldings) which is accomplished by reversing the motor and using parking cams at the pivot pins of the intermediate crank arm. When the switch is turned to the "off" position, the motor reverses direction and at the same time the parking cams rotate 180 degrees, lengthening the linkage slightly to park the blades against the windshield moulding. The linkage shortens when the motor runs in the wiping direction (Figs. 1 and 3).

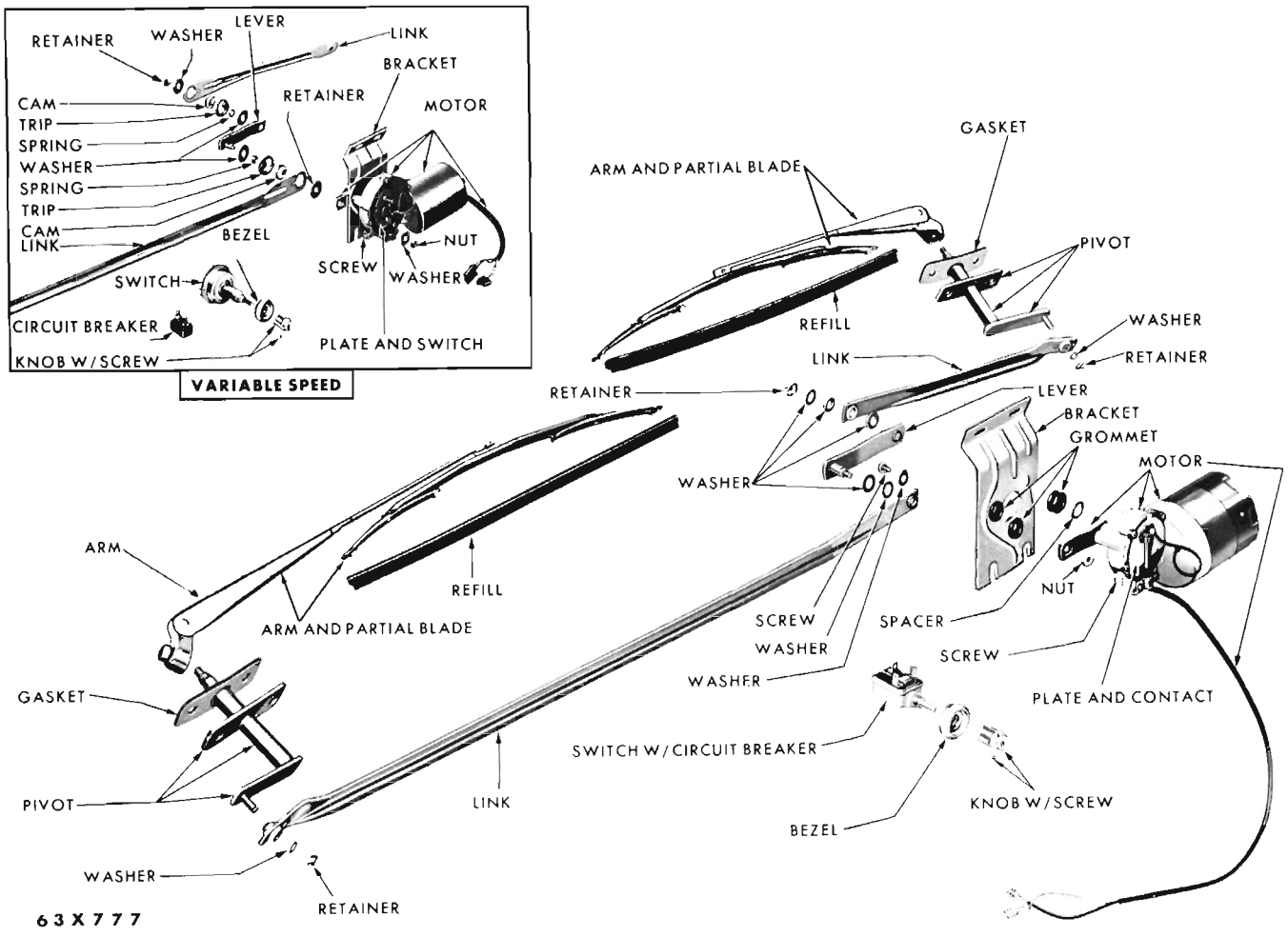


Fig. 1—Windshield Wiper Variable and Single Speed (Plymouth)

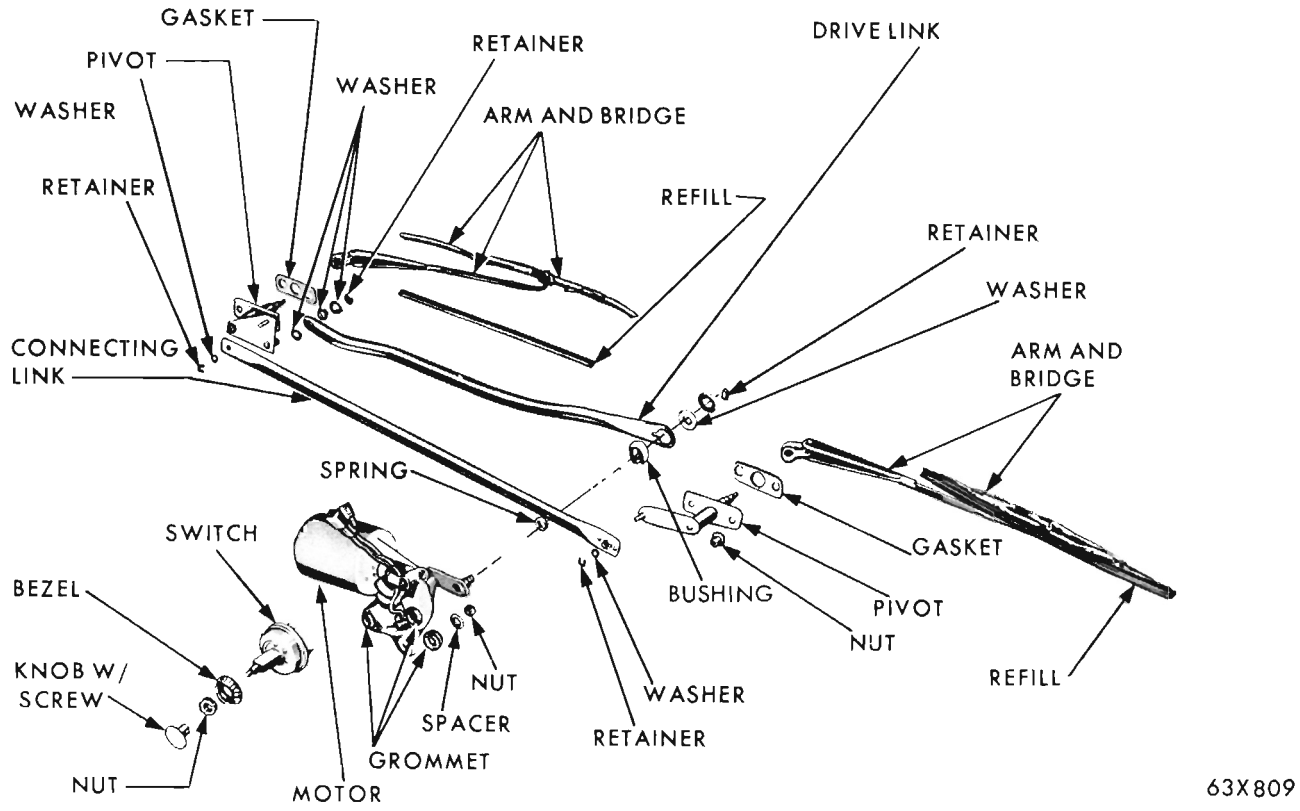


Fig. 2—Windshield Wiper Single Speed (Disassembled) (Valiant)

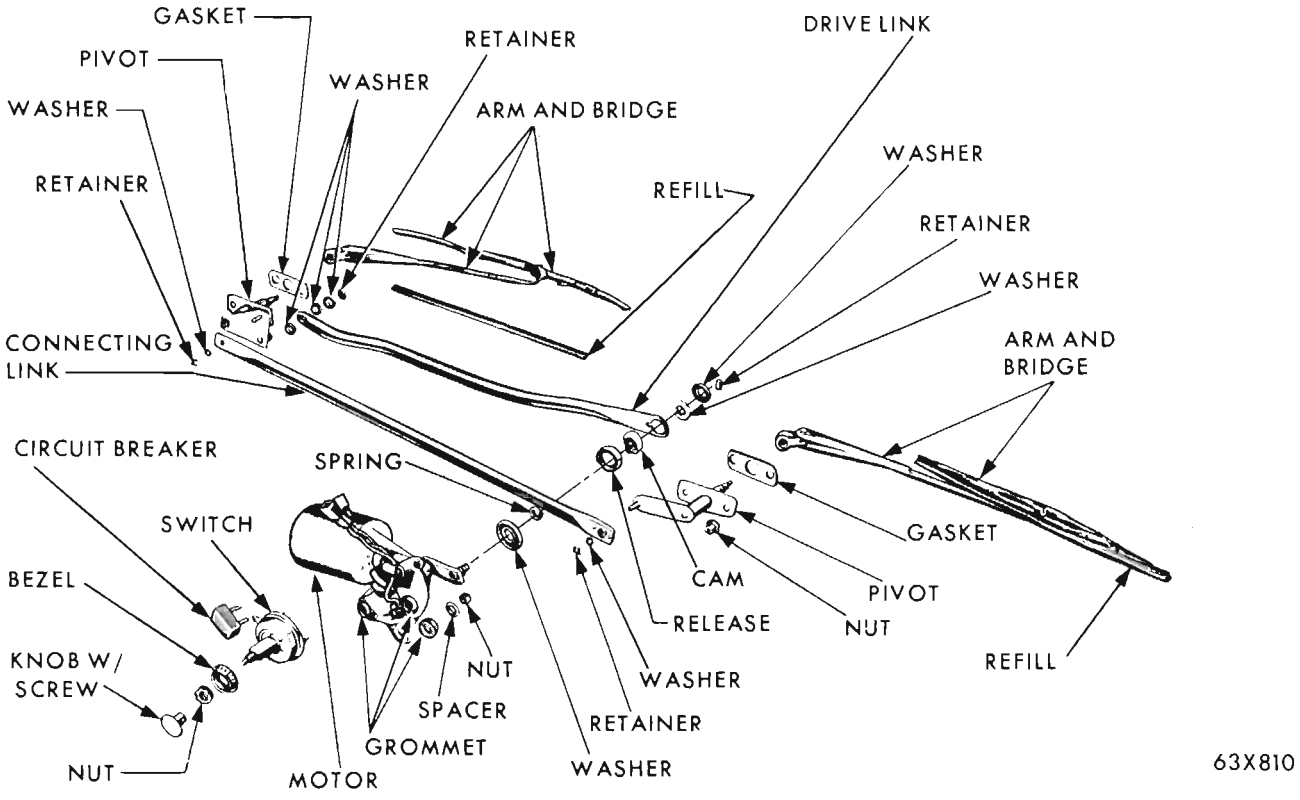


Fig. 3—Windshield Wiper Variable Speed (Disassembled) (Valiant)

SERVICE PROCEDURES

1. WIPER ARM ADJUSTMENT

NOTE: The wiper arm is equipped with a three-jaw clutch which provides infinitely fine adjustment of the wiper arm position. The serrations which key the clutch jaws to the tapered portion of the wiper pivot shaft do not restrict or control angular positioning of the wiper arm. This system differs from the other types of arms which provide stepped positioning by means of the attaching serrations.

Variable Speed

Plymouth

To determine if an adjustment is required apply an upward force, parallel to the windshield glass, at the end of the wiper arm (where the wiper blade is attached to the arm). Measure the force necessary to pull the tip of the wiper blade out of contact with the windshield moulding. If this separation force is not between 10 and 40 ounces loosen the wiper arm nut and change the arm position to bring the separation force into the 10 to 40 ounce range for both wiper arms.

Valiant

Same procedures as outlined for Plymouth Variable Speed, except the separation force should be 3 to 15 ounces for the **right** wiper arm and 5 to 25 ounces for the **left** arm.

Single Speed

Plymouth

To determine if an adjustment is required apply a constant downward force of 24 ounces, parallel to the windshield glass, at the end of the wiper arm (where the wiper blade is attached to the arm). With the 24 ounces force applied pull the wiper blade away from the windshield glass once or twice to prevent glass friction from affecting downward movement of the wiper arm and blade. With this force applied the clearance between the tip of the wiper blade and the windshield moulding should be between ¼ and 1 inch. If the clearance is not in the specified range loosen the wiper arm nut and change the arm position to bring the clearance into the correct position for both wiper blades.

Valiant

Use the same procedures as outlined for Plymouth, Single Speed except use a constant force of 20 ounces. The clearance should be between ¾ and 1½ inches for the **left** blade and between 1½ and 2½ inches for the **right** blade.

2. WIPER MOTOR PARK SWITCH TIMING

The timing of the wiper motor park switch must be:

(a) late enough that the wiper arms come to rest at the extreme lower limit of travel on dry glass.

(b) early enough that the wiper arms do not raise appreciably beyond the lower limit of travel on fully wet glass.

Adjust the timing of the park switch on the wiper motor to provide "shut off" at the lowest point of wiper blade travel under both wet and dry glass conditions.

When adjusting the timing of the variable speed park switch, note that the variable speed motor rotates in reverse at the time the park switch opens. "Early" and "Late" directions are therefore opposite to single speed motors.

3. WIPER PARKING OPERATION TEST—VARIABLE SPEED

(1) Turn the instrument panel wiper switch to **ON** and allow the wiper system to run through several cycles of operation.

(2) Very slightly, after the wiper blades reach the top of the wipe pattern, turn the wiper switch to **OFF** to cause the blades to park in a one-half (½) cycle of wiper motor operation.

If the blades do not park in the desired ½ cycle but require 1½ cycles to park, the procedure of going through the switching operation must be repeated as follows:

a. Turn the switch to the "ON" position and allow the wiper system to operate for a few cycles.

b. Turn the switch to the "OFF" position, only this time allow the timing of operating the switch to occur at a position in respect to wiper blade travel that is slightly later than the first operation. Again, note cycle requirement to reach park.

Having parked the wiper system in ½ cycle of motor operation note whether the wiper blades have traveled well below the normal wipe pattern. If they have not, replacement of the parking cam, spring and spring trip is indicated. If they have, but have not reached the windshield moulding, wiper arm adjustment is required. See Paragraph 1.

4. PARKING SPRING LUBRICATION—VARIABLE SPEED

To insure satisfactory life of the parking mechanism use only Lead-Plate, MoPar Part #2275437 to lubricate the parking spring during service. It is

essential to thoroughly coat all rubbing surfaces of the spring and pin area. Use of any other lubricant than Led-Plate (such as lubriplate, etc.) will result in noisy operation, rapid wear of components and premature failure of the parking mechanism.

5. WIPER MOTOR—PLYMOUTH

Removal

NOTE: On models equipped with air-conditioning the wiper motor must be serviced through the glove box opening in the instrument panel.

(1) From under the instrument panel remove the clips that retain the wiper drive links to the left and right windshield wiper pivots. Lift the drive links off of the pivot pins.

(2) Disconnect the wiring terminals at the windshield wiper motor.

(3) Remove the support brace from the wiper motor mounting bracket to the instrument panel lower reinforcement.

(4) Remove the four nuts that attach the wiper motor mounting bracket to the mounting studs on the cowl panel.

(5) Remove the wiper motor, wiper motor mounting bracket, and the wiper drive links as an assembly from under the instrument panel by carefully pulling the assembly down and to the right and out through the right door opening.

Installation

NOTE: On models equipped with air-conditioning the wiper motor must be serviced through the glove box opening in the instrument panel.

(1) Working through the right door opening install the wiper motor, wiper motor mounting bracket, and wiper drive links as an assembly under the instrument panel.

(2) From under the instrument panel position the windshield wiper assembly on to the four mounting studs on the cowl panel.

(3) Install the four nuts that attach the wiper motor mounting bracket to the cowl studs. Tighten the nuts securely.

(4) Install the support brace from the wiper motor mounting bracket to the instrument panel lower reinforcement.

(5) Connect the wiring terminals at the windshield wiper motor.

Position the wiper drive links on to the right and left pivot pins. Install the retaining clips.

6. WIPER MOTOR—VALIANT

Removal

(1) Disconnect the wiper link at the wiper motor. For variable speed motors note position of follower cam.

(2) Disconnect the wiper motor lead wires at the wiper motor.

(3) Remove the three nuts attaching the wiper motor and wiper motor bracket assembly to the cowl panel and pull the motor and bracket assembly down from the bracket mounting studs and out from underneath the instrument panel.

Installation

(1) Enter the wiper motor and mounting bracket from underneath the instrument panel and position the mounting bracket and install the three mounting nuts. Tighten the mounting nuts securely.

(2) Connect the lead wires to the wiper motor at the wiper motor.

(3) Connect the wiper link at the wiper motor and install the retaining clip. For variable speed motors position the follower cam as outlined in Paragraph 14.

7. DISASSEMBLY OF WIPER LINKS

(1) Remove the clip holding the link to the crank arm.

(2) Remove bevel washers and link.

(3) Remove the parking cam and spring release (Variable Speed).

(4) Remove coil spring by spreading the ends (Variable Speed).

(5) On Plymouth disassemble the right-hand link in same manner after removing crank arm to lever nut and the spacing washers between the link crank arm and lever.

8. WIPER MOTOR DISASSEMBLY

Variable Speed

(1) Remove the switch plate and the cover plate.

(2) Remove the crank arm nut, washers, crank arm, and gear in that order.

(3) Remove the end head through bolts and pull out the end head using care so as not to break the lead wire to the brush holder and remove the armature.

Single Speed

(1) Remove the switch plate.

(2) Remove the motor crank nut, washers and motor crank arm, noting sequence of washers and the position of park switch components.

(3) Lift out the nylon gear. Note position of the gear.

(4) Remove the end head through bolts and carefully pull off the head and remove the armature.

9. INSPECTING WIPER MOTOR

(1) Thoroughly inspect the motor parts for wear, corrosion or damage.

(2) Clean the armature commutator with 00 or 000 sandpaper or if necessary due to excessive wear replace the windshield wiper motor.

(3) Replace worn or oil soaked brushes.

(4) Test the armature and crankshaft in their respective bushings and replace worn parts if any looseness is detected.

(5) Inspect the gears for worn or broken teeth and replace gears showing damage or excessive wear.

10. WIPER SWITCH (Instrument Panel Mounted)

Variable Speed

The switch contains a bar resistance plate which provides a means of controlling the amount of current flow to the motor. The switch is designed to provide a circuit to the motor to reverse the direction of the current to the field winding thus providing a means of reversing the armature. A separate circuit breaker is attached to the "B" terminal of the switch to protect the motor.

To test the switch, refer to the proper wiring diagram, disconnect the lead wires and remove the switch. Connect a jumper wire from the battery positive terminal to the case of the switch and another wire from the battery positive terminal to the "FI" terminal of the switch. Connect a test lamp between the battery negative terminal and the "B" terminal of the switch. Lamp should light when switch is turned on and gradually dim as switch is rotated clockwise. Lamp should go out when switch is turned "off". The switch is serviced only as an assembly.

Single Speed

The switch contains a built-in circuit breaker to protect the motor and is serviced only as an assembly. To test the switch, refer to the proper wiring diagram, disconnect the lead wires and remove the switch from the instrument panel. Connect a test lamp between "B" terminal of the switch and negative battery post. Connect the positive battery terminal to the "P" terminal of the post. Lamp should remain lighted in either "ON" or "OFF" position. Failure to light indicates a faulty circuit breaker.

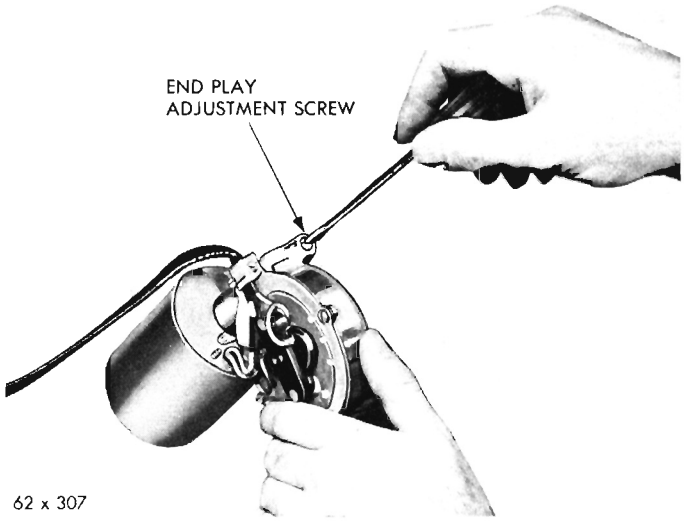


Fig. 4—End Play Adjustment

11. END PLAY ADJUSTMENT

To adjust the armature shaft end play turn adjustment screw in until it bottoms and back-off ¼ turn, as shown in Figure 4.

12. WIPER MOTOR BENCH TESTING

Variable Speed

(1) Connect a jumper wire between the wiper motor yellow wire and the wiper motor ground strap. Connect another jumper wire between the battery negative terminal and the wiper motor ground strap. Connect another jumper wire between the wiper motor blue and yellow wires and the battery positive terminal. The wiper motor should run continuously in the wipe direction.

(2) Connect a jumper wire between the wiper motor blue and yellow wires and the battery positive terminal. Connect another jumper wire between the wiper motor red wire and the wiper motor ground strap. Connect another jumper wire between the battery negative terminal and the wiper motor ground strap. The wiper motor should run in reverse and stop at the park position.

Single Speed

(1) Connect a jumper wire between the battery negative terminal and the wiper motor ground strap. Connect another jumper wire between the black and blue wires of the wiper motor and the battery positive terminal. The motor should run continuously.

(2) With the jumper wires connected, as in Step 1, disconnect the black wire from the jumper wire

leaving the blue wire connected to the battery positive terminal. The wiper motor should park.

13. ASSEMBLING WIPER MOTOR

Make sure the wiper motor gear teeth are adequately covered with long fibre grease.

Correct indexing of the contact plate (single speed motor) or the contact follower (variable speed motor) on the nylon gear is important. On Plymouth models after the armature, nylon gear, and crank arm are installed, index the contact plate (constant speed motor) on the nylon gear with the slot pointing in the same direction as the motor crank arm. Install the contact follower (variable speed motor) with open end pointing in same direction as motor crank arm.

14. WIPER LINK ASSEMBLY

Variable Speed—Plymouth

Install spring washer, concave surface toward crank arm. Install the crank pivot coil spring on the pivot. Install the spring release.

Install the parking cam to index with spring release and engage spring ends, between the release and parking cam in openings at point of index, as shown in Figure 5.

When assembling to the left link the "L" on the left crank and on the parking cam should be seen. The cam marked "R" is installed in the same manner. If the intermediate crank is held so that the letter "L" can be seen from this position, the opposite side will show three letters "R".

Install the link arm with the stop projection on the link arm toward the cam assembly. Install the spring washer, convex surface toward the cam assembly.

Install the retaining bolt and nut, as shown in Figure 6.

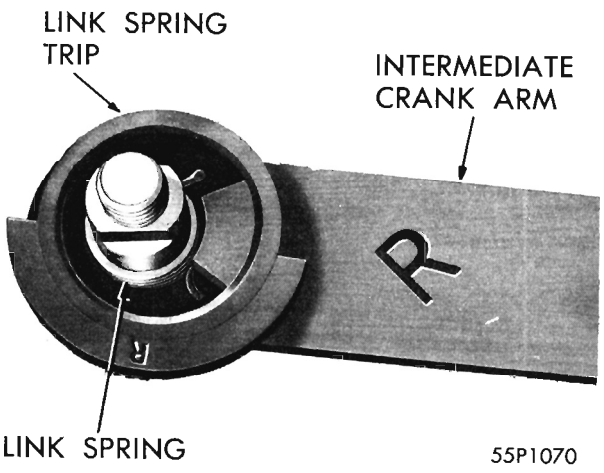


Fig. 5—Link Spring Trip Installed (Variable Speed) Plymouth

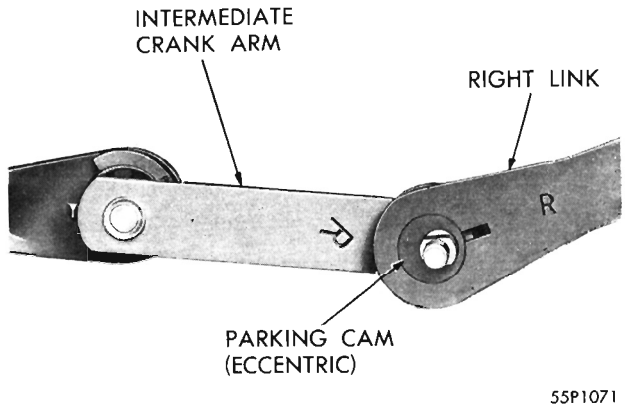


Fig. 6—Link Arm Installed (Variable Speed) Plymouth

Assemble the left link and cam assembly in the same manner locking in place with a clip.

Variable Speed—Valiant

Install the flat washer on the motor crank arm pin. Assemble the release, parking cam, and parking spring, as shown in Figure 7, and install on the motor crank arm pin.

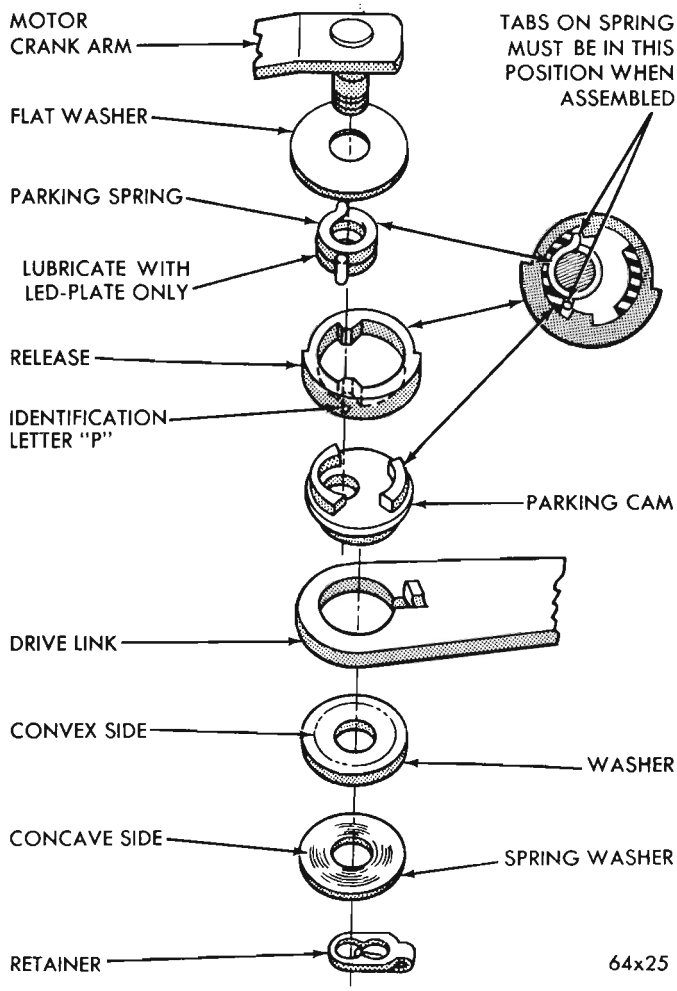


Fig. 7—Variable Speed Parking Mechanism—Valiant

Install the drive link on the motor crank arm pin making sure the parking cam is seated correctly in the opening in the drive link. Install the convex washer and the concave spring washer as shown in Figure 7.

Install the retainer on the end of the motor crank arm pin.

Single Speed—Plymouth

(1) Install a felt washer over the intermediate crank arm stud; follow with the right hand link and another felt washer. Install the intermediate crank stud (with link installed) on the wiper motor crank and install the attaching nut.

(2) Install a felt washer, the left hand link, another felt washer and shim washer over the remaining pin of the intermediate crank and retain with the retaining clip.

Single Speed—Valiant

(1) Place the nylon insert in the end of the wiper drive link with the metal ear into the keying slot.

(2) Install the link and bushing.

(3) Install the cone washer and the retaining clip.

15. REPLACING WIPER PIVOT

(1) Remove the wiper arm.

(2 Disconnect the link from the pivot.

(3) Remove the pivot and gasket.

(4) Install a new gasket and pivot.

(5) Tighten the retaining stud nuts 75 inch-pounds torque.

(6 Reconnect link to pivot crank pin and install washer and retainer clip.

(7) Install the wiper arm.

SERVICE DIAGNOSIS

WINDSHIELD WIPERS

Condition	Possible Cause	Correction
Wiper Fails to Operate	(a) Binding linkage.	(a) Relieve the binding condition.
	(b) Faulty instrument panel switch.	(b) Test Switch. See "Wiper Switch (Instrument Panel Mounted)."
	(c) Faulty Motor.	(c) Test motor. See "Wiper Motor Bench Testing."
	(d) Open or Grounded wiring.	(d) Test wiring for continuity. Repair as necessary.
Wiper Blades Not Parking Properly	(a) Arm set at incorrect position.	(a) Adjust arm. See "Wiper Arm Adjustment."
	(b) Motor park switch timing incorrect.	(b) Time park switch. See "Wiper Motor Park Switch Timing."
	(c) Broken link spring. (Variable Speed)	(c) Replace Spring. See "Wiper Link Assembly".
	(d) Link spring trip not engaging stop on linkage. (Variable Speed)	(d) Inspect "Wiper Link Assembly."
Blades Slap Windshield Mouldings	(a) Improperly adjusted wiper arm.	(a) See "Wiper Arm Adjustment".
	(b) Looseness of the motor crank or other drive parts.	(b) Replace the defective part.

SERVICE DIAGNOSIS—(Continued)

WINDSHIELD WIPERS

Condition	Possible Cause	Correction
Blades Chatter	(a) Twisted arm holds blade at wrong angle to glass. (b) Wrong type blades used. (c) Foreign substances such as body polish on glass.	(a) Replace wiper arm. **Do not attempt to straighten bent or twisted arm.** (b) Install correct wiper blades. (c) Clean the glass.
Motor will not Stop when Instrument Panel Switch is Turned "OFF"	(a) Motor park switch failure in the "closed" position.	(a) Repair or replace motor park switch.
Motor Stops in any Position when Instrument Panel Switch is Turned "OFF"	(a) Motor park switch failure in the "Open" position.	(a) Repair or replace motor park switch.

HORNS

1. TESTING HORNS

Touch a jumper wire from relay "S" terminal to ground. If horn blows, difficulty is in the horn button contact ring, the grounding of the steering column, or in wire from "S" terminal to horn button. If horn fails to blow, connect a jumper wire from "B" terminal to "H" terminal. If horns operate, relay is defective. If horns fail to operate, difficulty is in wire to the horns, in the horns, the wire to horn relay "B" terminal or in the grounding of the steering column.

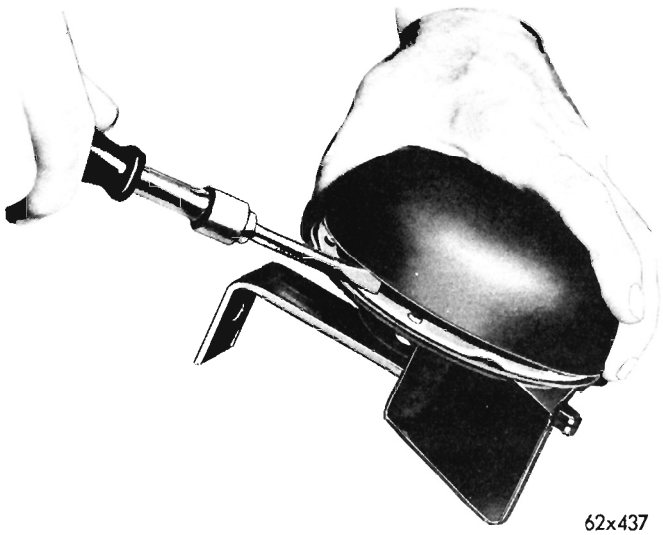


Fig. 1—Removing the Cover (Auto-Lite Horn)

2. ADJUSTING HORNS

Autolite Horn

(1) Disconnect connections at each horn to determine which horn is not operating.

(2) Remove horn and bracket assembly. Do not remove horn from bracket. (The bracket is retained to the horn by a self-threading screw.)

(3) Pry the cover off (Fig. 1).

(4) Turn the adjusting nut counter-clockwise until there is no vibration (sound), see Figure 2.

(5) Turn the adjusting nut clockwise, approximately ¼ turn at a time until the tone has a clear mellow sound. Do not turn nut while horn is blowing.

NOTE: Adjustment will only clear up sound and cannot change horn tone frequency.

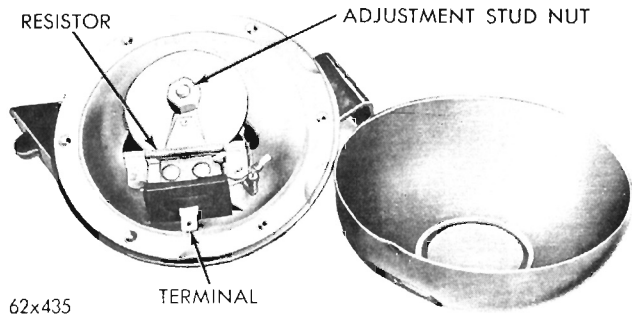


Fig. 2—Cover Removed (Auto-Lite Horn)

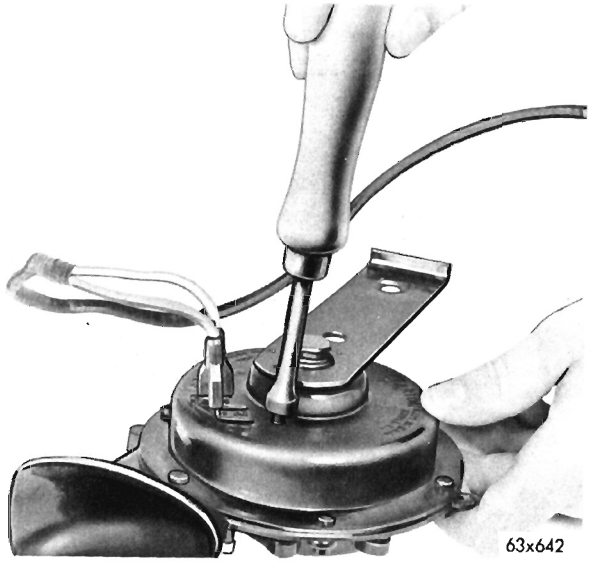


Fig. 3—Adjusting Sparton Horn

(6) Check horn solenoid coil leads, make sure they are securely wrapped on horn coil terminals. If lead wires are loose, solder them securely to the coil terminals. Use resin core solder.

(7) Check horn contacts. If contacts are badly burned, check resistor for continuity. If contacts are separated, when adjusting nut is removed from the adjusting stud; contacts have taken a permanent set and horn should be replaced.

(8) Connect a test ammeter between the positive post of a 12 volt battery and horn terminal post. Connect a jumper lead from the negative battery post to the horn base. Clean the paint from the horn bracket where the connection is made. Turn the adjusting nut to obtain a reading of eight amperes minimum to ten amperes maximum at 12.5 volts.

NOTE: Must not exceed ten amperes maximum.

Sparton Horn

(1) Disconnect connections at each horn to determine which horn is not operating.

(2) Remove horn and bracket assembly.

(3) With a suitable spanner wrench (Fig. 3,) turn the tone adjuster counter-clockwise until there is no vibration (sound).

(4) Turn the tone adjuster clockwise, approximately ¼ turn at a time until the tone has a clear mellow sound. Do not turn tone adjuster while horn is blowing.

NOTE: Adjustment will only clear up sound and cannot change horn tone frequency.

(5) Connect a test ammeter between the positive post of a 12 volt battery and horn terminal post. Connect a jumper lead from the negative battery post to the horn base. Clean the paint from the horn bracket where the connection is made. Turn the tone adjuster to obtain a reading of six amperes minimum to eight amperes maximum at 12.5 volts.

NOTE: Must not exceed eight amperes maxmum.

SERVICE DIAGNOSIS

HORNS

Condition	Possible Cause	Correction
Horns Will Not Blow	(a) Improper adjustment.	(a) See "Adjusting Horns".
	(b) Broken or faulty wiring.	(b) See "Testing Horns".
	(c) Faulty horn.	(c) See "Testing Horns". Replace horn if necessary.
	(d) Faulty relay.	(d) See "Testing Horns". Replace relay if necessary.
Horns Blow Continuously	(a) Shorted wiring.	(a) See "Testing Horns".
	(b) Horn button sticking.	(b) Disconnect battery ground cable. Release horn button. After correction, reconnect battery ground cable.
	(c) Relay sticking.	(c) Replace relay.

PART 8

POWER EQUIPMENT

ELECTRIC WINDOW LIFTS—PLYMOUTH

A master switch group, on the left front door, operates all the windows and the individual switches are located on their respective doors. The circuit breaker is above the left front cowl panel.

SERVICE PROCEDURES

1. WIRING TEST

Disconnect the cable at the battery negative post and remove the two window lift feed wires from the circuit breaker. **Do not** remove the battery feed wire. Reconnect the battery negative cable at the battery and replace the feed wires one at a time as follows:

(1) One feed wire feeds the left front door.

(2) The other feed wire feeds the right front door and both rear doors.

(3) Test the wiring to the doors one at a time to locate the short.

NOTE: When testing for faulty wiring, inspect the wiring harness control wires for a break behind the plate and sector or the regulator in each door.

2. MOTOR (Except 2 Door Hardtop Quarter Window)

Removal

(1) Remove the garnish moulding and trim panel.

(2) Remove the two nuts that attach the motor to the gearbox assembly.

(3) Drop the motor down off the gearbox assembly.

(4) Ground the motor through bolt to the body inner panel.

(5) Test the operation of the motor using the window lift switch. If the motor is defective replace the motor. **Do not** attempt any internal service on the motor.

(6) Disconnect the lead wires to the motor and remove the motor.

Installation

(1) Position the motor on the gearbox assembly and install the two mounting nuts.

(2) Connect the wiring to the motor.

(3) Test operation of the motor using the window lift switch.

(4) Install the trim panel and garnish moulding.

3. WINDOW LIFT (Except 2 Door Hardtop Quarter Window)

Removal

(1) Disconnect the battery cable at the battery negative terminal.

(2) Remove the garnish moulding, the door trim panel and disconnect the wires from the switch.

(3) Remove the clips from the regulator pins holding the lower glass channel.

(4) Raise the glass manually and prop in the up position.

(5) Remove the regulator attaching screws, pivot arm from the guide on the inner panel and remove the motor and regulator through the opening in the door.

(6) If it is necessary to replace the gear box, remove the regulator counter-balance spring.

NOTE: Be sure to remove the counter-balance spring before disassembling the gear box.

The gear box is replaced as an assembly only and is lubricated at assembly. No further lubrication is required.

Installation

(1) Place the motor and regulator through the door opening and insert the pivot arm into the guide on the inner panel.

(2) Install the regulator screws finger tight. **DO NOT** tighten at this time.

(3) Remove the window prop and lower the glass.

(4) Insert the control arms into the glass channel, using a leather washer on each side of the channel and secure with a clip.

(5) Connect the wires to the motor and connect the battery.

(6) Operate the window several times and stop the glass halfway.

(7) Tighten the regulator screws.

(8) Inspect the glass alignment.

(9) Connect a test ammeter into the electrical circuit and operate the window. The ammeter reading should be constant without fluctuation at approximately 14 amperes.

If the ammeter reading fluctuates, there is a bind in the glass or in the linkage. The down stop should be adjusted so that the window is flush with the garnish moulding.

(10) Install the trim panel, switch and garnish moulding.

4. QUARTER GLASS REGULATOR (2 Door Hardtop)

NOTE: If the window regulator is jammed in either the extreme "UP" or "DOWN" position it is necessary to remove the "UP" or "DOWN" regulator stop to allow removal of the window glass.

Removal

(1) Remove the rear seat.

(2) Remove the trim panel and garnish moulding.

(3) Run the window down (using the window lift switch) until the glass to window frame mounting screws are opposite the access holes in the inner panel.

(4) Remove the window glass mounting screws and lift the glass up out of the inner panel.

(5) Remove the regulator adjusting lock nut.

(6) Remove the roller track assembly.

(7) Remove the roller track assembly mounting bracket.

(8) Disconnect the wires to the motor.

(9) Unhook the lower glass frame from the regulator arm.

(10) Remove the regulator mounting screws.

(11) Remove the regulator assembly out through the access opening in the inner panel.

Installation

(1) Install the regulator assembly in through the access opening in the inner panel and install the mounting screws.

(2) Hook the lower glass frame to the regulator arm.

(3) Install the roller track assembly mounting bracket.

(4) Install the roller track assembly.

(5) Install the regulator adjusting lock nut.

(6) Install the window glass in through the top of the inner panel.

(7) Position the window glass to the lower glass frame and install the window glass mounting screws.

(8) Connect the wires to the motor.

(9) Test the operation of the window lift.

(10) Install the trim panel and garnish moulding.

(11) Install the rear seat.

SERVICE DIAGNOSIS

ELECTRIC WINDOW LIFTS

Condition	Possible Cause	Correction
A Window Will Not Operate from the Master Switch, But Can be Operated from the Individual Door Switch	(a) Faulty switch in the master switch group.	(a) Replace master switch.
	(b) Break in the wire at the door opening, or at the door holding the master switch group.	(b) Test for continuity, see "Wiring Diagrams". Repair wiring. Avoid making a splice in the flexing sections of the wiring harness.
None of the Windows Will Operate from the Master Switch or from the Individual Door Switch	(a) Faulty circuit breaker—located above left cowl panel.	(a) Replace circuit breaker and test the new circuit breaker to determine if voltage is present at the terminal opposite the battery feed.
	(b) Open in the battery feed wire from the circuit breaker to the alternator (ammeter).	(b) Test for continuity and repair as necessary.

SERVICE DIAGNOSIS—(Continued)

ELECTRIC WINDOW LIFTS

Condition	Possible Cause	Correction
A Window Cannot be Operated from Either the Master Switch or the Individual Door Switch	(a) Test for faulty circuit breaker located above left cowl panel.	(a) Replace circuit breaker.
	(b) Master switch and door switch inoperative.	(b) Test the master switch and door switch for continuity.
	(c) Open in wire between motor and switch.	(c) Test for continuity between the motor and the switch. Repair wiring as necessary.
	(d) Jammed gear box.	(d) Test and repair. Inspect motor to gear box alignment.
	(e) Coupling broken between the motor and the gear box.	(e) Replace coupling and test motor and gear box alignment.
	(f) Lift motor burned out.	(f) Repair or replace lift motor. Test for sticking door switch as possible cause of motor failure.
	(g) Short in the wiring circuit.	(g) Inspect and test wiring. See "Wiring Diagrams".
A Window Will Operate In One Direction Only When Controlled by Either the Master Switch or by the Individual Door Switch	(a) Faulty circuit between master switch and door switch.	(a) Test the master switch and door switch for continuity. Check for continuity between the motor leads and the switch.
	(b) If the window can be moved by rotating the coupling between the motor and the gear box.	(b) Remove the window lift motor and test on bench with battery voltage. See "Wiring Diagrams".
	(c) Lift motor burned out.	(c) Test for sticking switch.
	(d) Short in wiring circuit.	(d) Inspect and test all wiring. See "Wiring Diagrams".
Circuit Breaker Clicks "On" and "Off" Continuously and Window Does not Operate	(a) Short in the feed wire that feeds the right front and rear doors.	(a) Test the wiring, repair or replace as necessary.
	(b) A faulty switch.	(b) Replace the switch if necessary.

POWER SEATS

The power seat can be moved six ways—forward, back, up, down and tilt. The horizontal travel is five inches and horizontal plane of seat track is inclined eleven degrees. The vertical travel is one inch at front and two inches at rear. The available tilt is 8 degrees forward and 7½ degrees rearward from neutral.

SERVICE PROCEDURES

1. OPERATION (Fig. 1)

The motor operates a gear drive train which supplies power to the slave units, located in the seat tracks, through flexible cables. The control switch is on the left side of front seat and is wired through

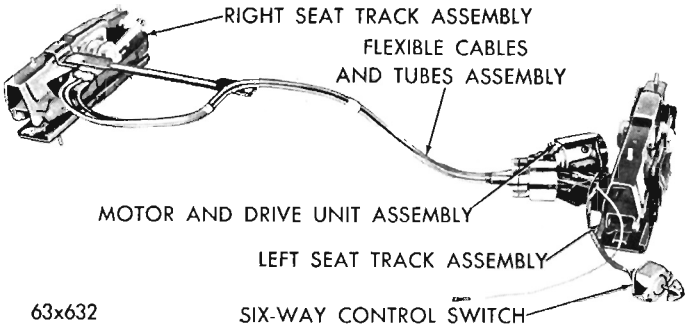


Fig. 1—Power Seat Arrangement

a relay to a 30 ampere circuit breaker, located above the left cowl panel.

The wire from the bulkhead disconnect supplies power to the circuit breaker.

Power is supplied to the relay from the circuit breaker.

Six wires go to the switch. One used for power, two for motor field current, which also actuates the relay for motor armature current and three wires attach to solenoids controlling the movement of the front riser, rear riser and horizontal movement.

The right and left tracks are each replaced as an assembly only. They cannot be adjusted and are not interchangeable.

2. FRONT SEAT ASSEMBLY AND ADJUSTER

Removal

(1) Disconnect the battery ground cable.

(2) Remove the four mounting stud nuts which hold the front seat to the adjuster and tilt the complete seat back assembly forward.

(3) Disconnect the switch control wires.

(4) Remove the front seat and cushion assembly.

(5) Disconnect the seat adjuster red feed wire.

(6) Remove the seat guide attaching stud nuts and remove the adjuster.

Installation

(1) Install the adjuster and seat guide stud nuts.

(2) Reconnect the seat adjuster red feed wire.

(3) Install the front seat assembly.

(4) Reconnect the control wires to the switch and tighten the mounting stud nuts securely.

(5) Reconnect the battery ground cable.

3. FLEXIBLE CABLES

Removal

(1) Remove the front seat assembly.

(2) Disconnect the red feed wire.

(3) Remove the retainer plate that holds the right side tubes to the drive assembly.

(4) Remove the left seat guide attaching stud nuts and remove the guide and the drive assembly (Fig. 2).

NOTE: Be careful not to bend or damage right side tubes when sliding tubes out of drive assembly.

(5) Pull the flexible cables from the right side tubes (Fig. 3).

(6) Remove the bolts that hold the motor and drive assembly to the left guide bracket.

(7) Remove the drive assembly with tubes from the left slave unit (Fig. 4).

(8) Remove the flexible cables from the tubes.

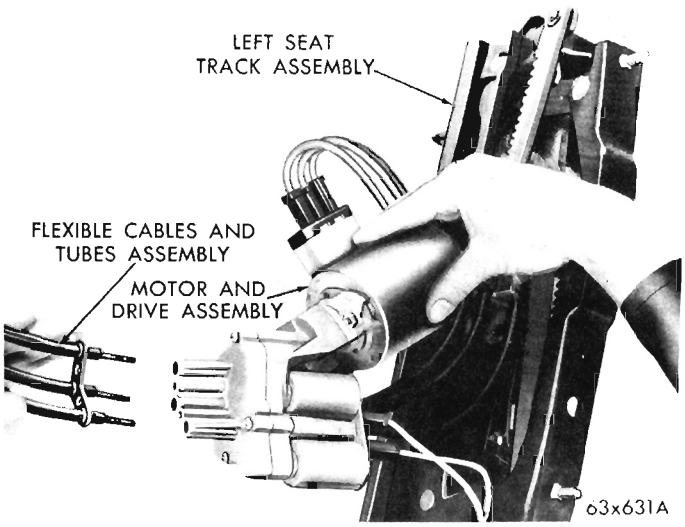


Fig. 2—Removing Cables from Drive Assembly

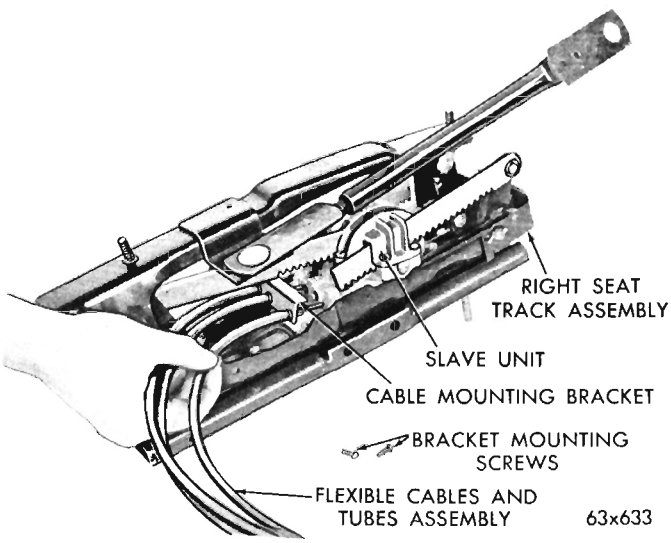


Fig. 3—Removing Cables from Right Slave Unit

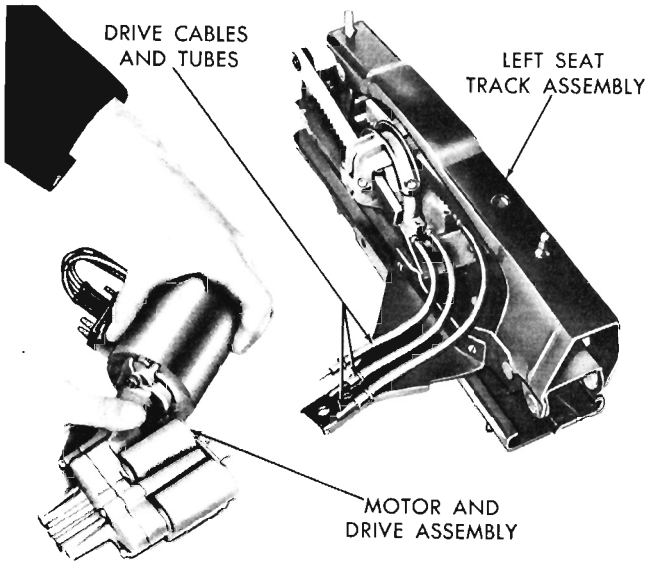


Fig. 4—Removing Drive Assembly from Left Slave Unit

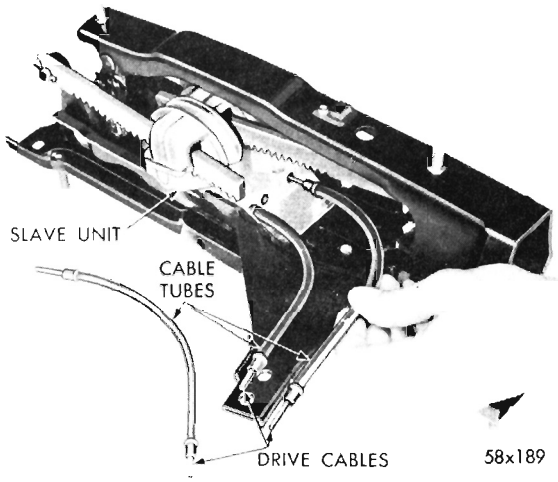


Fig. 5—Installing Left Cable Tubes in Slave Unit

Installation

CAUTION: Seat guides should be in the up and forward position when installing cables. Make sure both guides are at the same position (in alignment.)

(1) Place the three left cable tubes into the left slave unit (Fig. 5).

(2) With the shortest tube on the inside and longest on the outside, install the flexible cables in the tubes. Make sure the cables seat in the slave unit.

(3) Position the drive unit on the left side tubes. Make sure the flexible cables seat in the slot in the drive unit.

(4) Bolt the drive unit to the guide bracket.

(5) Place the right side flexible cables in the right side tubes.

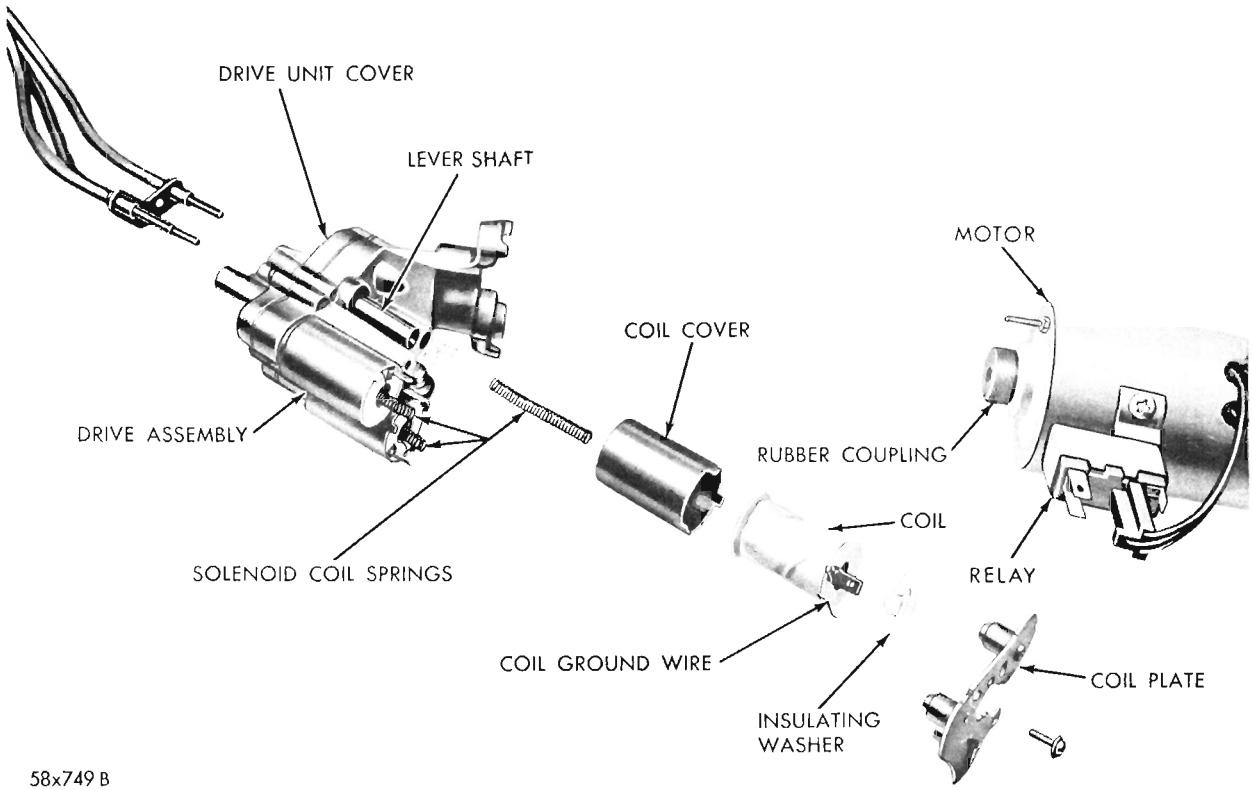


Fig. 6—Solenoid and Coil (Disassembled View)

(6) Position the left guide and drive assembly on the right side tubes. Make sure the cables seat in the drive assembly.

(7) Install the right side tubes retainer plate.

(8) Bolt the left guide assembly to the floor.

(9) Install the seat and cushion assembly.

(10) Reconnect the red feed wire and test the operation of the seat.

4. SEAT MOTOR (Fig. 6)

Removal

(1) Remove the two mounting stud attaching nuts that hold the left side of the front seat to the seat adjuster.

(2) Prop-up the left side of the seat cushion approximately six inches.

(3) Disconnect the control switch wires from the relay on the motor.

(4) Remove the two nuts that attach the motor to the drive unit.

(5) Remove the motor and rubber coupling from the drive unit.

(6) Disconnect the motor wires from the relay.

(7) Remove the relay from the motor.

Installation

(1) Position the relay on the motor and install the attaching screw.

(2) Connect the motor wires to the relay.

(3) Install the motor and rubber coupling to the drive unit. Install the two attaching nuts.

(4) Connect the control switch wires to the relay on the motor.

(5) Remove the prop from the left side of the seat cushion. Position the seat on the seat adjuster and install the two mounting stud attaching nuts.

5. DRIVE UNIT AND SOLENOID ASSEMBLY

Disassembly

(1) Remove the drive unit from the seat assembly. Refer to "Removal of Flexible Cables" steps 1 through 4.

(2) Remove the two screws holding the plate and solenoids to the drive unit (Fig. 6).

(3) Remove the plate and solenoid assembly. Be careful not to lose the three springs under the solenoid.

(4) To remove the solenoid coils, bend back on the tabs of the solenoid cover. Unsolder the coil ground wire at the cover tab and remove the coil cover from the coil.

(5) Remove the screws holding the cover on the drive unit.

(6) Remove the cover and lift out the clutch lever and shaft.

Assembly

(1) Install the clutch lever and shaft. Make sure the lever is properly seated on the collar.

(2) Install the cover and screws.

(3) Install the coil in the coil cover with the coil ground wire next to one of the cover tabs.

(4) Position the cover tabs in the slots on the coil plate.

(5) Bend over the tabs and resolder the coil ground wire to the tab and plate.

(6) Install the three solenoid spring and position the solenoids over the springs.

(7) Fasten the solenoids to the drive unit.

(8) Install the drive unit. Refer to "Installation of Flexible Cables", steps 1 through 4.

6. SLAVE UNIT

Removal

(1) Remove the drive unit and the cables. Refer to "Removal of Flexible Cables", steps 1 through 4. The seat guide should be in the up and forward position.

(2) Remove the long clevis pin from the front of the guide (Fig. 7).

(3) Remove the front rack clevis pin.

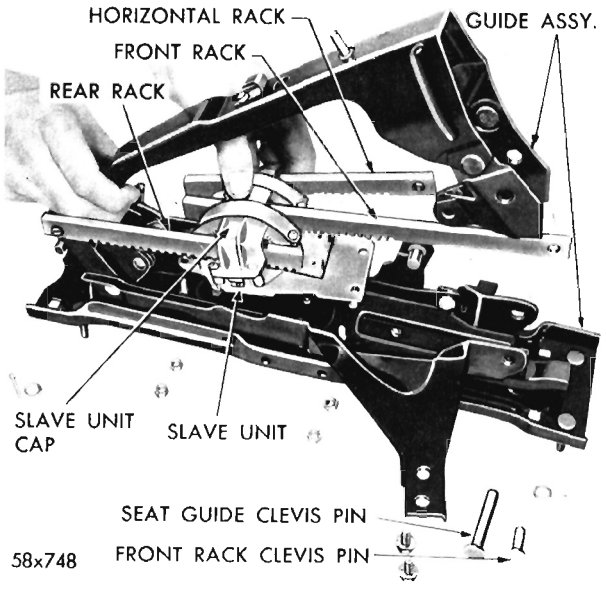


Fig. 7—Removing the Left Slave Unit

(4) To facilitate the removal of the slave unit, remove the slave unit cap.

NOTE: Be careful not to lose the springs under the cap. The springs are between the racks and the slave cap.

(5) Remove the nuts holding the slave unit to the guide.

(6) Remove the slave unit.

Installation

(1) Position the slave unit over the studs on the guide base.

(2) Position the racks in the slave unit so they will be in the up and forward position.

(3) Fasten the racks to the guide assembly.

(4) Position the springs on the racks and install the slave unit cap.

(5) Install the slave unit mounting nuts.

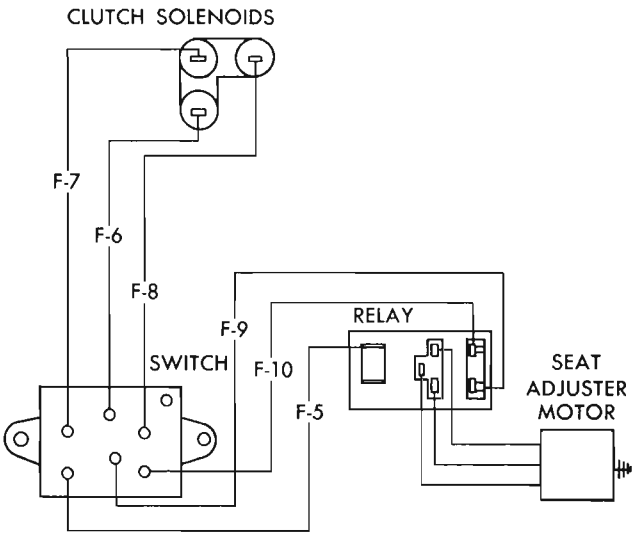
(6) Install the front guide clevis pin.

(7) Install the cables in their slots and try operation of guide.

Install drive unit and cables. Refer to "Installation of Flexible Cables", steps 6 through 9.

7. POWER SEAT WIRING

Refer to Figure 8 for wiring of the power seat assembly.



NO.	COLOR	CIRCUIT
F-5	RED	FEED
F-6	BROWN	FRONT ELEVATOR
F-7	DARK GREEN	HORIZONTAL
F-8	YELLOW	REAR ELEVATOR
F-9	WHITE	DOWN AND REARWARD
F-10	DARK BLUE	UP AND FORWARD

64 x 416

Fig. 8—Six-Way Power Seat Wiring

SERVICE DIAGNOSIS

POWER SEATS

Condition	Possible Cause	Correction
Entire Unit Inoperative	(a) Broken wire or loose connections in any part of motor control circuit.	(a) Test electrical continuity of the system. Repair as necessary.
Motor Inoperative	(a) Short or open circuit between power source, faulty relay, switch or motor.	(a) Test the red wire at relay with a test light. If the test light does not light, check for continuity in the red feed wire, a faulty circuit breaker or a poor connection between the circuit breaker and alternator (ammeter). If the test light lights, connect the red feed wire with the red and black or red and green wires from the motor. If motor runs, relay is faulty.
	(b) Faulty Motor.	(b) Repair or replace motor.

SERVICE DIAGNOSIS—(Continued)

POWER SEATS—(Continued)

Condition	Possible Cause	Correction
Seat Inoperative (Motor Runs)	(a) Short or open circuit between the switch and affected solenoid.	(a) Jump the wire from the red feed wire to each solenoid terminal on the clutch assembly. Each solenoid should "Click" as the jumper is connected. If solenoid does not click: Test the wire in the harness for an open circuit. Repair. Test for a possible seized solenoid armature in the coil. Replace the coil. Test for a possible burned-out solenoid. Replace the solenoid.
Seat Inoperative (Motor Runs and Solenoid Click)	(a) Possible stripped or broken gear in the drive unit.	(a) Inspect and replace the drive unit if necessary.
Slave Unit Inoperative (Motor, Solenoids and Drive Unit O.K.)	(a) Possible broken drive cable.	(a) Inspect and replace the parts as necessary.
Excessive Free Play in the Unit (Seat has a Rocking Motion, Excessive Movement between the Slide and the Base of the Track assembly)	(a) Possibly due to the roller Fig. 9, being out of position.	(a) Repair as follows: (1) Remove the power seat from the vehicle. (2) Remove the seat drive tubes from the slave unit. **CAUTION: Do not run the seat motor with the drive cables and tubes disassembled or the unit will be placed out of synchronization.** (3) Remove the seat support (B) and the rear clevis pin. Refer to "Slave Unit Removal" steps 5 and 6. (4) Remove the seat slave unit from the seat track slide (C). Refer to "Slave Unit Removal" steps 5 and 6. (5) Remove the horizontal stops located on the slide at (D). (6) Separate the seat slide (C) from the base (N) by pressing the slide rearward which will allow the rollers (A) to jump the retaining rivets (E, F, G, H), thereby separating the slide from the base. (7) Remove the rivet (F) and replace with 5/16-18 x ½" bolt (I) as shown to retain the rollers in the proper position. To reassemble, reverse the above sequence. **In reassembly, frayed drive cable may occur. Such a cable may be repaired by applying a light coating of solder and then grinding to cable size.**

SERVICE DIAGNOSIS—(Continued)

POWER SEATS—(Continued)

Condition	Possible Cause	Correction
Seat Track Excessively Loose (A loose Rivet Joint)	(a) Loose rivet joints.	(a) Disassemble the upper track seat support (B) by removing the cotter keys and pins. Remove the seat support and tighten all the riveted joints (J) by peening with a ball peen hammer. (Fig. 9).
Loose Front Levers	(a) Movement between the two sections comprising the front lever assembly (Fig. 9).	(a) Arc weld the front levers (K) to prevent movement between the two sections.
Seat Chuck Fore and Aft	(a) Loose horizontal rack support arm to lower track base.	(a) Repair as follows: (1) Remove the seat track from the vehicle and arc weld as shown (at "L" Fig. 9). (2) Tighten the rack attaching pins (M) by arc welding (Fig. 9).
	(b) Loose horizontal rack in slave unit gear train.	(b) Test and replace slave unit if necessary.

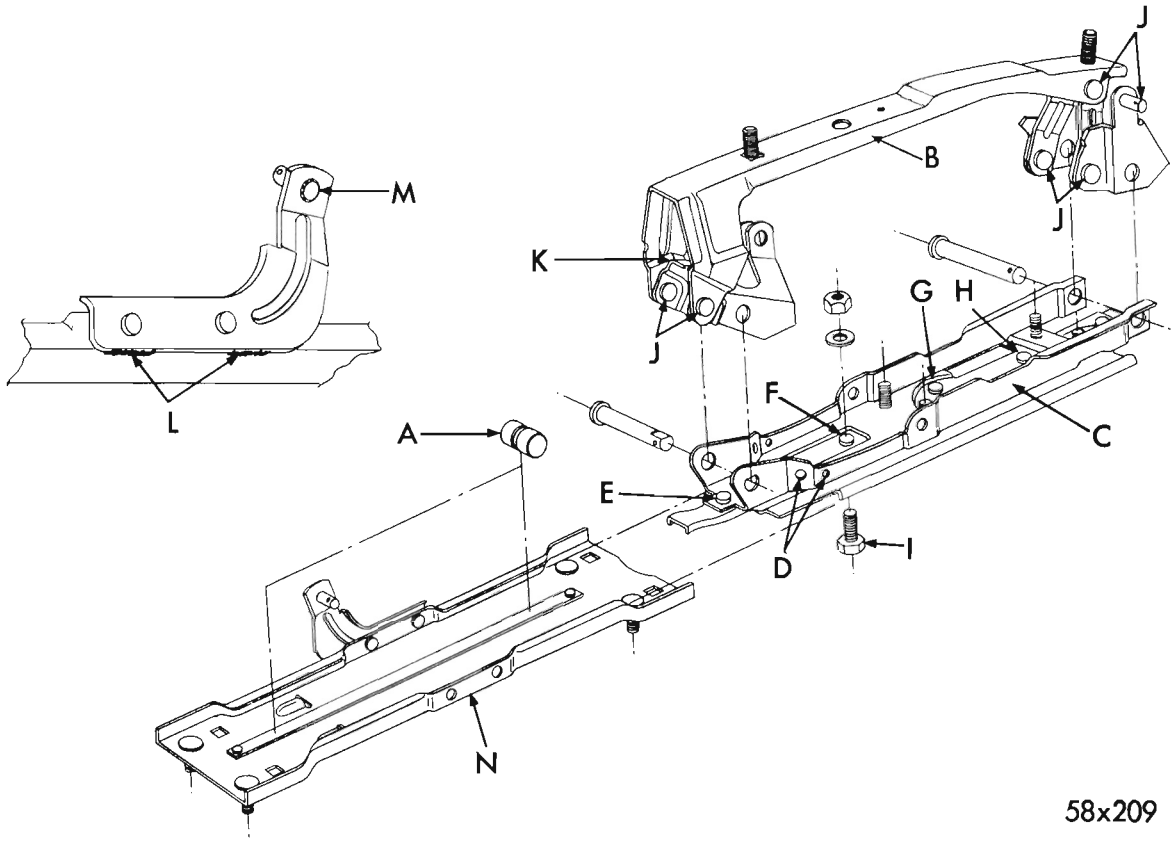
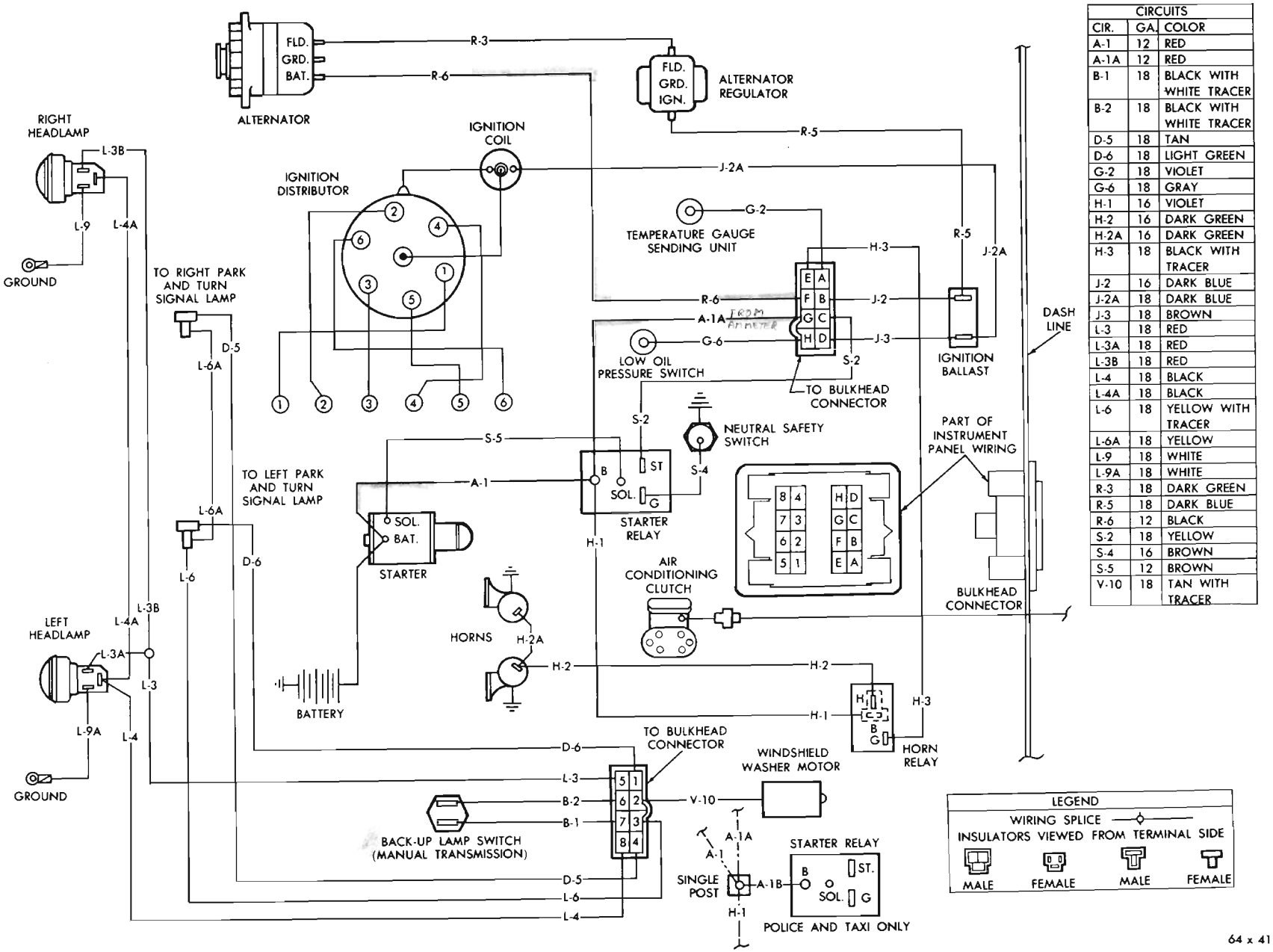


Fig. 9—Seat Guide (Disassembled View)



CIRCUITS		
CIR.	GA.	COLOR
A-1	12	RED
A-1A	12	RED
B-1	18	BLACK WITH WHITE TRACER
B-2	18	BLACK WITH WHITE TRACER
D-5	18	TAN
D-6	18	LIGHT GREEN
G-2	18	VIOLET
G-6	18	GRAY
H-1	16	VIOLET
H-2	16	DARK GREEN
H-2A	16	DARK GREEN
H-3	18	BLACK WITH TRACER
J-2	16	DARK BLUE
J-2A	18	DARK BLUE
J-3	18	BROWN
L-3	18	RED
L-3A	18	RED
L-3B	18	RED
L-4	18	BLACK
L-4A	18	BLACK
L-6	18	YELLOW WITH TRACER
L-6A	18	YELLOW
L-9	18	WHITE
L-9A	18	WHITE
R-3	18	DARK GREEN
R-5	18	DARK BLUE
R-6	12	BLACK
S-2	18	YELLOW
S-4	16	BROWN
S-5	12	BROWN
V-10	18	TAN WITH TRACER

64 x 41

Fig. 1—Engine Compartment Wiring (Valiant)

CIRCUITS		
CIR.	GA.	COLOR
A-1	12	RED
B-1	18	WHITE
B-1A	18	WHITE
B-1B	18	WHITE
B-2	18	WHITE
B-2A	18	WHITE
B-2B	18	WHITE
C-1	16	BLACK WITH TRACER
C-4	16	BROWN
C-5	16	DARK GREEN
D-1	18	BLACK
D-2	18	RED
D-2A	18	RED
D-3	18	PINK
D-4	18	WHITE
D-4A	18	WHITE
D-5	18	TAN
D-5A	18	TAN
D-6	18	LIGHT GREEN
D-6A	18	LIGHT GREEN
D-7	18	BROWN
D-7A	18	BROWN
D-8	18	DARK GREEN
D-8A	18	DARK GREEN
D-9	18	TAN
D-10	18	LIGHT GREEN
E-1	18	TAN
E-2	18	ORANGE
E-2A	18	ORANGE
G-1	18	BLACK
G-2	18	VIOLET
G-4	18	LIGHT BLUE
G-5	18	DARK BLUE
G-6	18	GRAY
H-3	18	BLACK WITH TRACER
H-3A	18	BLACK
J-1	12	RED

CIRCUITS		
CIR.	GA.	COLOR
J-2	16	DARK BLUE
J-3	18	BROWN
L-1	16	BLACK
L-2	16	LIGHT GREEN
L-3	18	RED
L-4	18	BLACK
L-5	18	RED
L-6	18	YELLOW WITH TRACER
L-7	18	BLACK
L-8	18	PINK
M-1	18	PINK
M-2	18	YELLOW
M-2A	18	YELLOW
M-2B	18	YELLOW
M-5	18	PINK
M-5A	16	PINK
Q-1	12	BLACK
Q-2	14	BLACK
Q-2A	14	BLACK
Q-3	14	RED WITH TRACER
Q-4	14	BLACK
R-6	12	BLACK
R-6A	12	BLACK
S-2	18	YELLOW
V-1	16	PINK
V-3	16	BLACK WITH TRACER
V-3A	16	BLACK
V-4	16	RED
V-4A	16	RED
V-5	16	YELLOW
V-5A	16	YELLOW
V-6	16	DARK BLUE
V-6A	16	DARK BLUE
V-9	16	BLACK
V-10	18	TAN
X-1	16	RED
X-12	18	BLACK

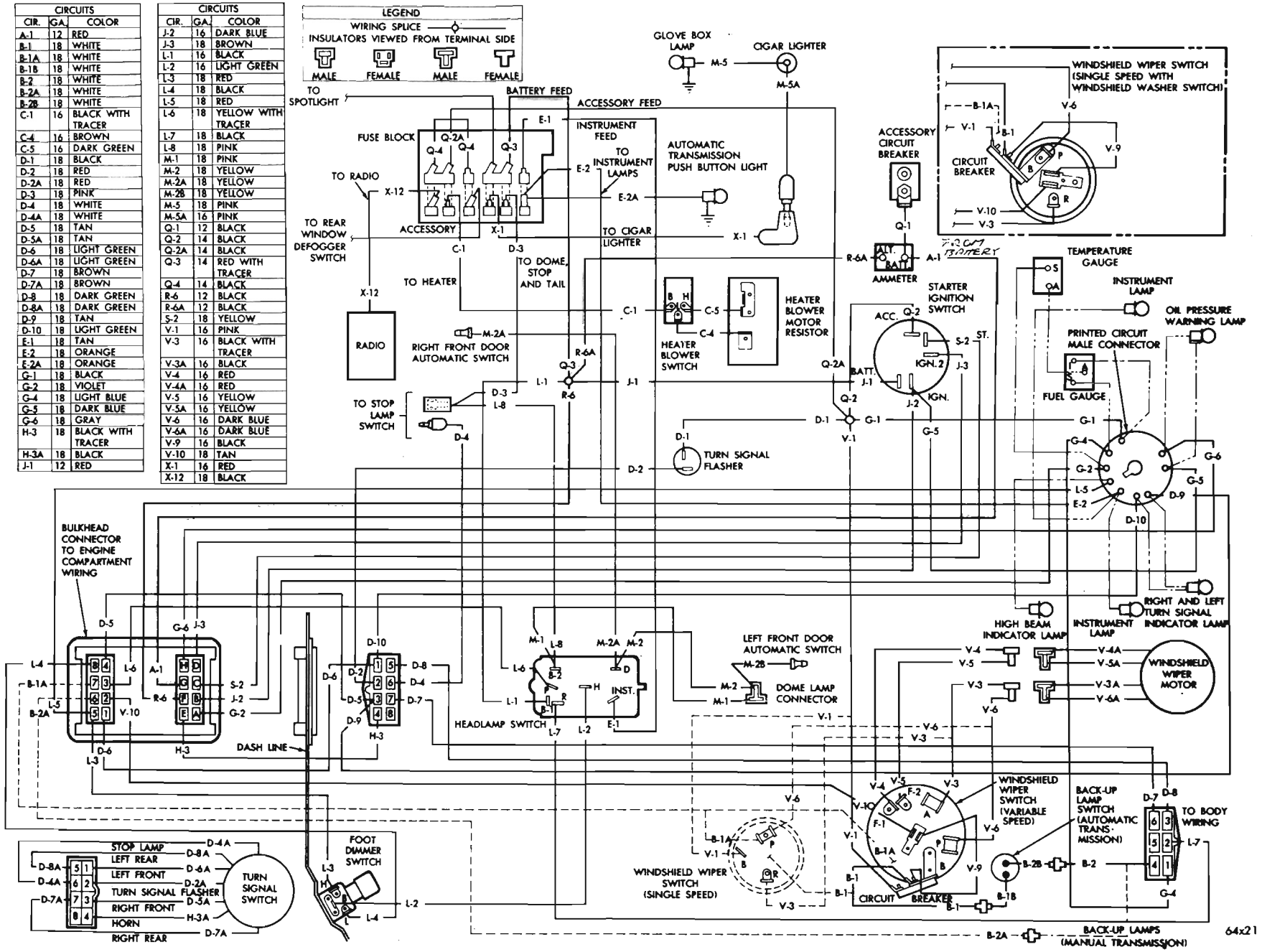
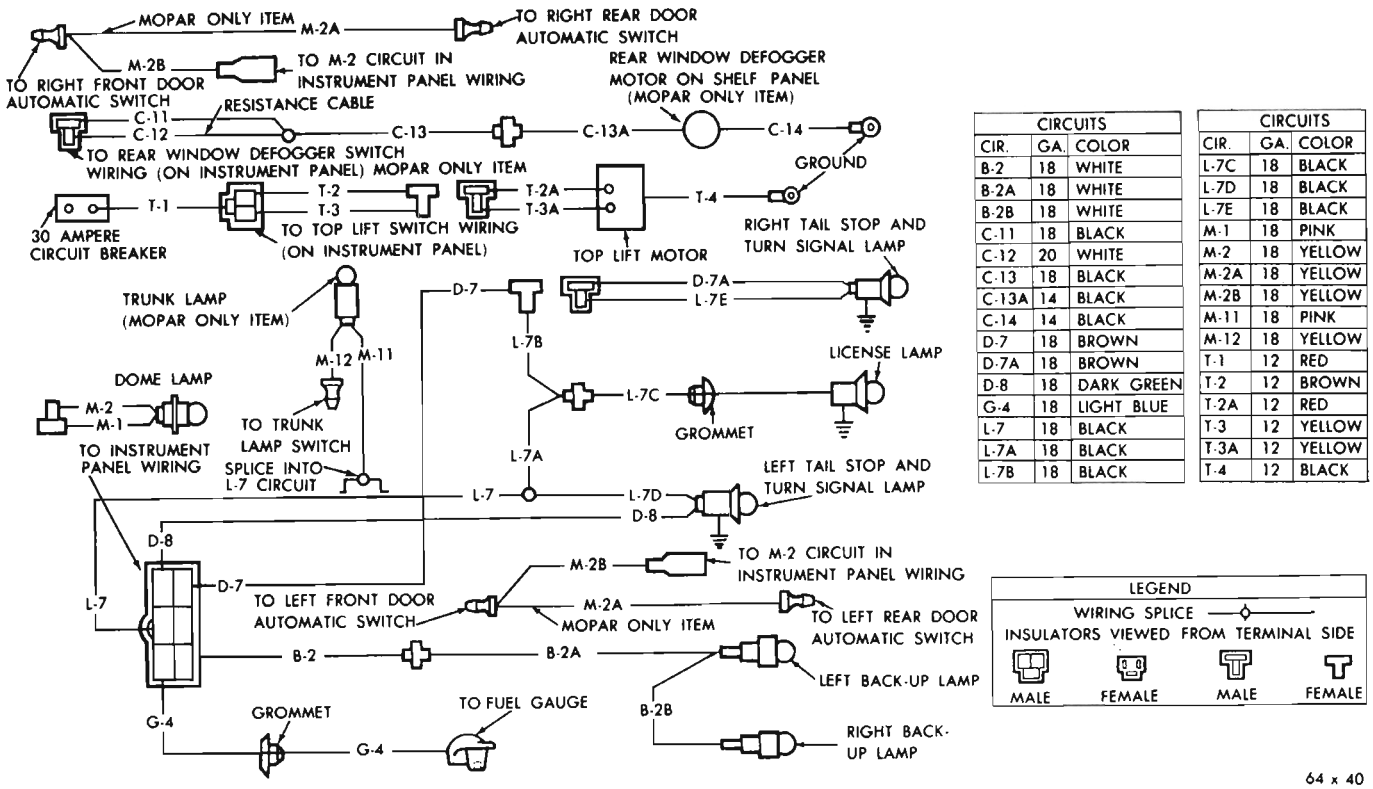


Fig. 2—Instrument Panel Wiring (Valiant)



CIRCUITS		
CIR.	GA.	COLOR
B-2	18	WHITE
B-2A	18	WHITE
B-2B	18	WHITE
C-11	18	BLACK
C-12	20	WHITE
C-13	18	BLACK
C-13A	14	BLACK
C-14	14	BLACK
D-7	18	BROWN
D-7A	18	BROWN
D-8	18	DARK GREEN
G-4	18	LIGHT BLUE
L-7	18	BLACK
L-7A	18	BLACK
L-7B	18	BLACK

CIRCUITS		
CIR.	GA.	COLOR
L-7C	18	BLACK
L-7D	18	BLACK
L-7E	18	BLACK
M-1	18	PINK
M-2	18	YELLOW
M-2A	18	YELLOW
M-2B	18	YELLOW
M-11	18	PINK
M-12	18	YELLOW
T-1	12	RED
T-2	12	BROWN
T-2A	12	RED
T-3	12	YELLOW
T-3A	12	YELLOW
T-4	12	BLACK

Fig. 3—Body Wiring (Except Station Wagon) Valiant

CIRCUITS		
CIRCUIT	GA.	COLOR
B-2	18	WHITE
B-2A	18	WHITE
D-7	18	BROWN
D-8	18	DARK GREEN
G-4	18	LIGHT BLUE
L-7	18	BLACK
L-7A	18	BLACK
L-7B	18	BLACK
L-7C	18	BLACK
M-1	18	PINK
M-2	18	YELLOW
W-5	12	RED
W-5A	12	RED
W-5B	12	RED
W-5C	12	RED
W-15	12	BROWN
W-15A	12	WHITE
W-15B	12	BROWN
W-15C	12	BROWN
W-15D	12	BROWN
W-15E	14	BLACK
W-25	12	YELLOW
W-25A	12	YELLOW
W-25B	12	YELLOW
W-25C	12	YELLOW
W-25D	14	GREEN

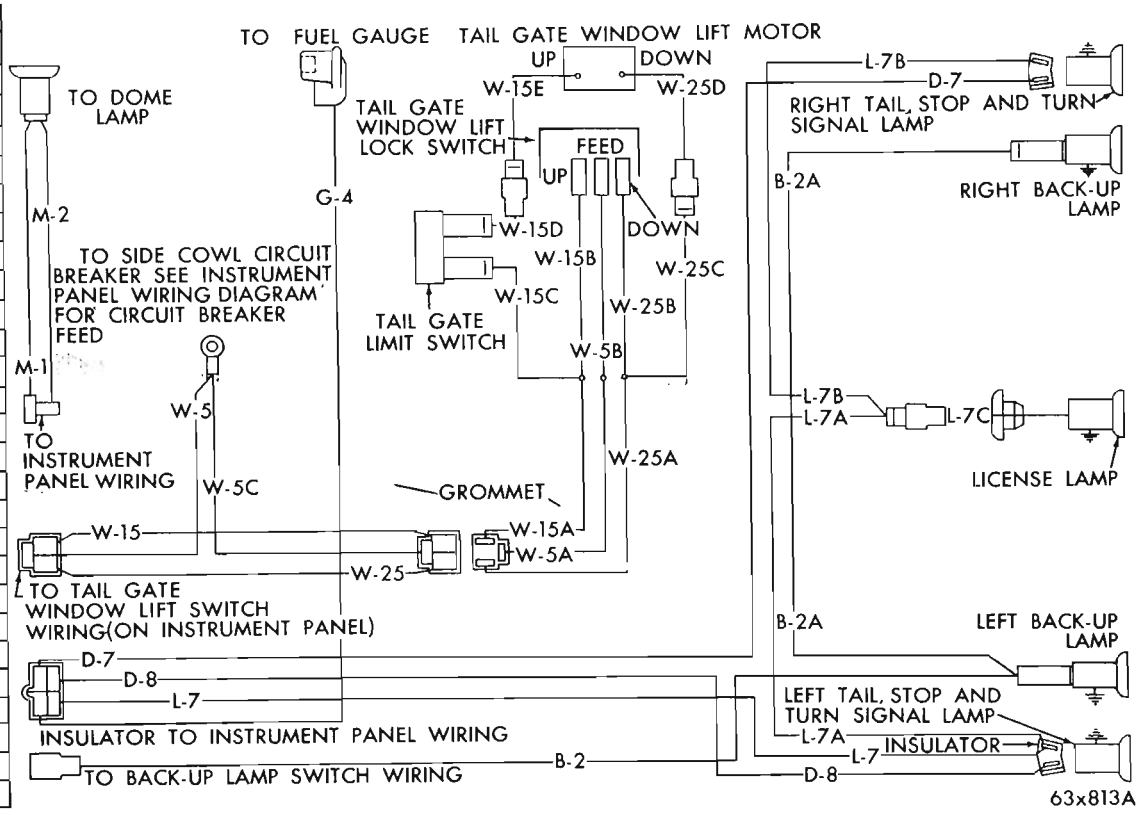
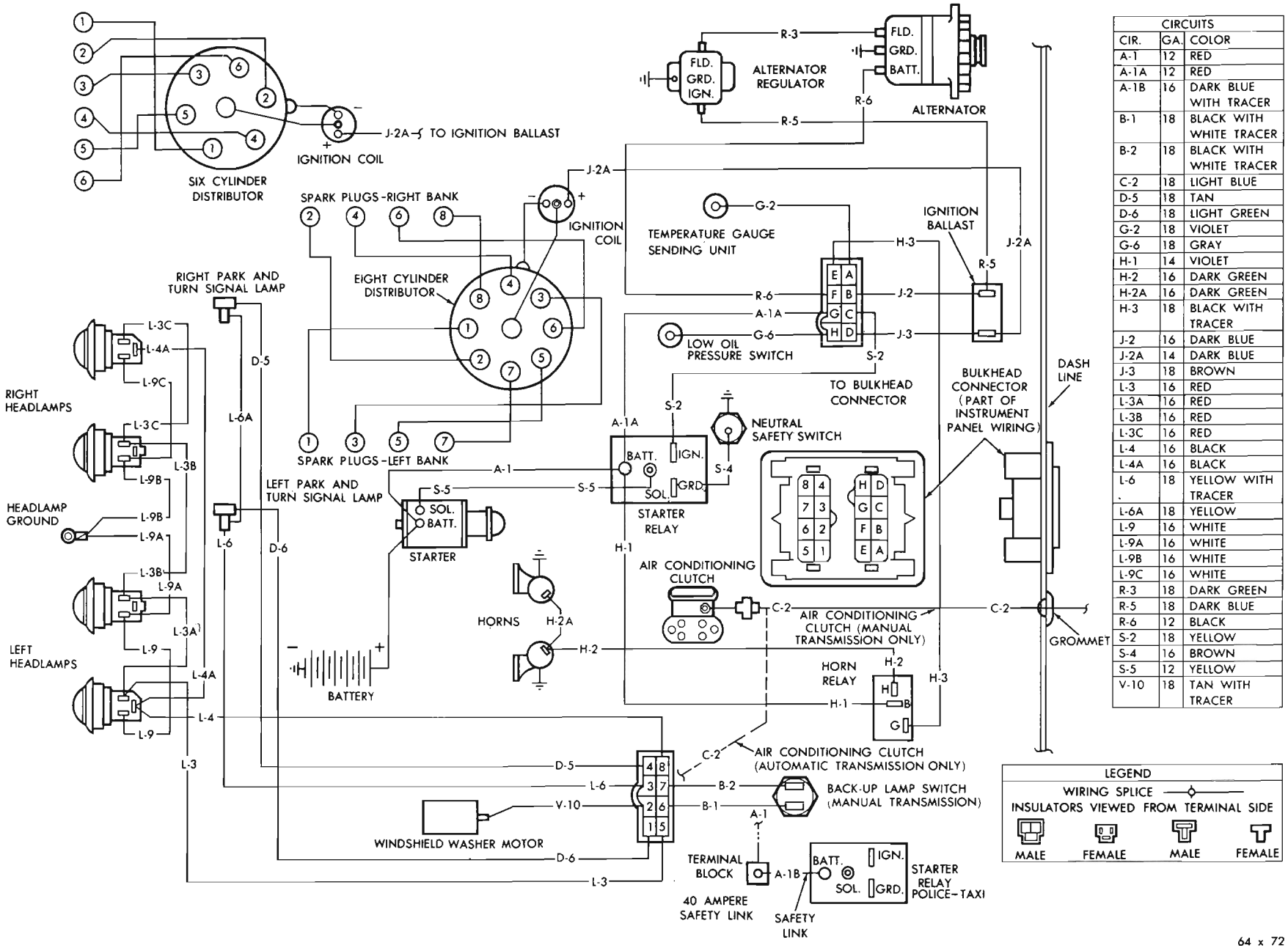


Fig. 4—Body Wiring (Station Wagon) Valiant



CIRCUITS		
CIR.	GA.	COLOR
A-1	12	RED
A-1A	12	RED
A-1B	16	DARK BLUE WITH TRACER
B-1	18	BLACK WITH WHITE TRACER
B-2	18	BLACK WITH WHITE TRACER
C-2	18	LIGHT BLUE
D-5	18	TAN
D-6	18	LIGHT GREEN
G-2	18	VIOLET
G-6	18	GRAY
H-1	14	VIOLET
H-2	16	DARK GREEN
H-2A	16	DARK GREEN
H-3	18	BLACK WITH TRACER
J-2	16	DARK BLUE
J-2A	14	DARK BLUE
J-3	18	BROWN
L-3	16	RED
L-3A	16	RED
L-3B	16	RED
L-3C	16	RED
L-4	16	BLACK
L-4A	16	BLACK
L-6	18	YELLOW WITH TRACER
L-6A	18	YELLOW
L-9	16	WHITE
L-9A	16	WHITE
L-9B	16	WHITE
L-9C	16	WHITE
R-3	18	DARK GREEN
R-5	18	DARK BLUE
R-6	12	BLACK
S-2	18	YELLOW
S-4	16	BROWN
S-5	12	YELLOW
V-10	18	TAN WITH TRACER

LEGEND

WIRING SPLICE

INSULATORS VIEWED FROM TERMINAL SIDE

MALE FEMALE MALE FEMALE

64 x 72

Fig. 5—Engine Compartment Wiring (Plymouth)

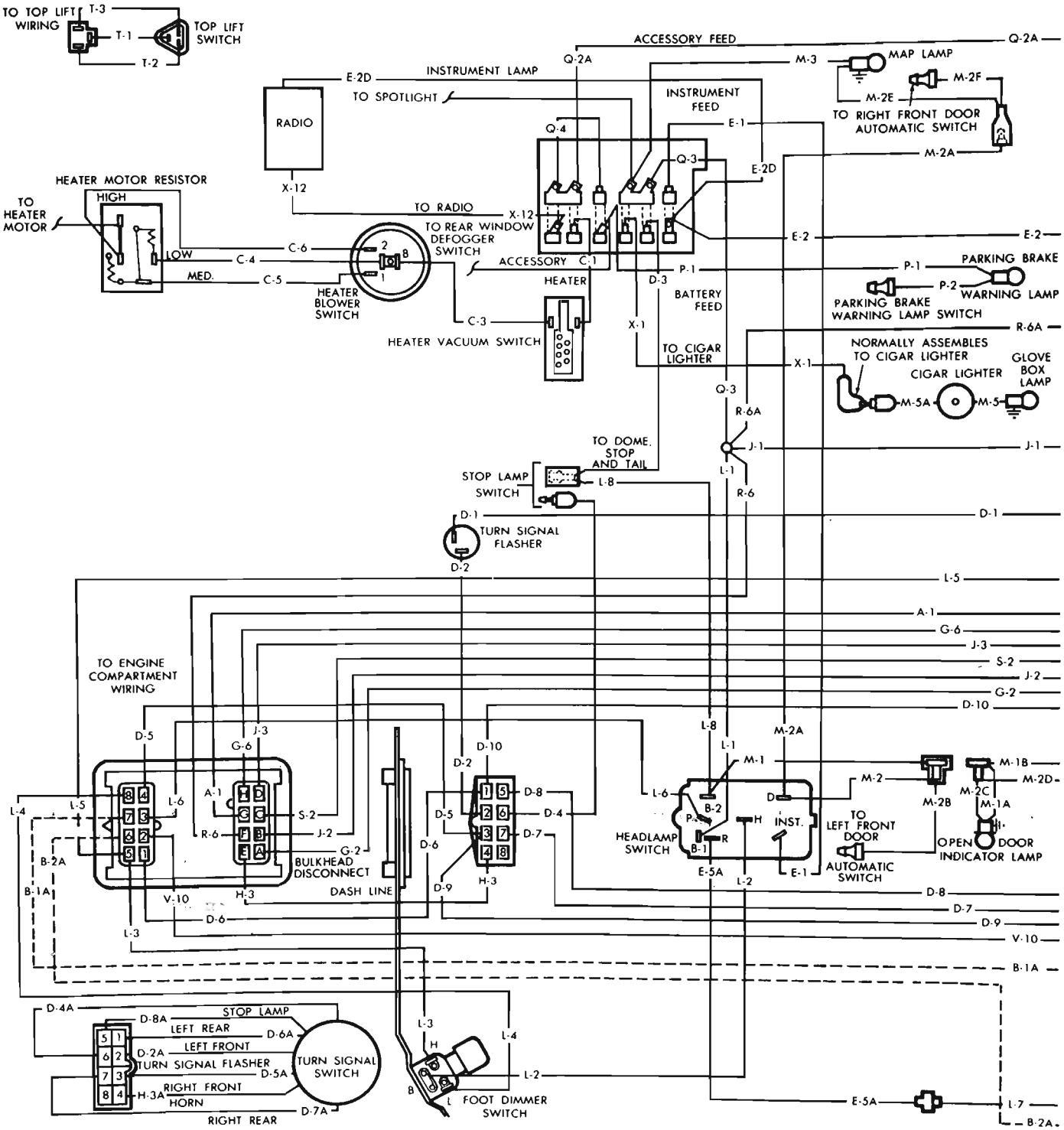
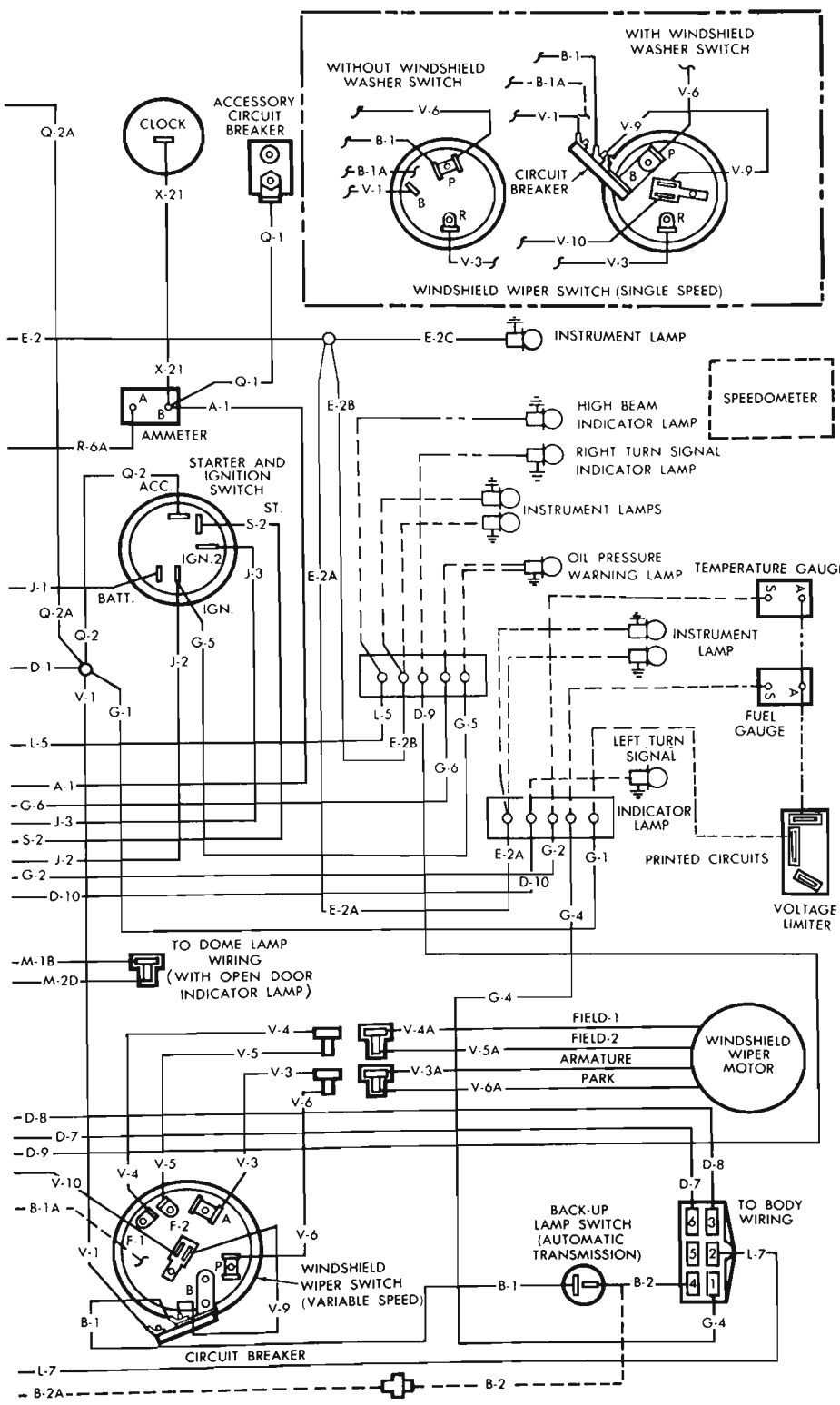


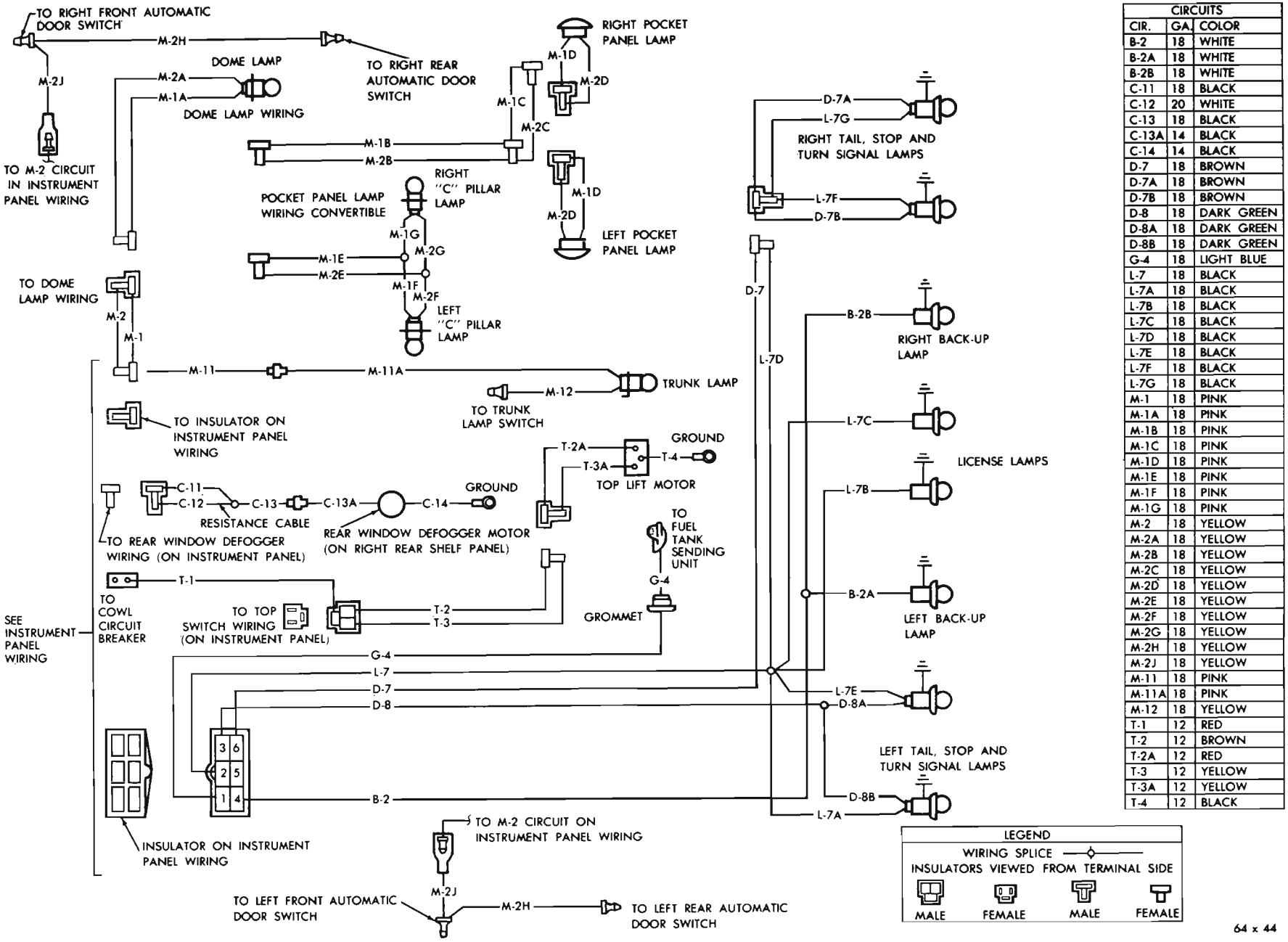
Fig. 6—Instrument Panel Wiring (Plymouth)



CIRCUITS		
CIR.	GA.	COLOR
A-1	12	RED
B-1	18	WHITE
B-1A	18	WHITE
B-2	18	WHITE
B-2A	18	WHITE
C-1	14	BLACK
C-3	16	VIOLET
C-4	16	BROWN
C-5	16	DARK GREEN
C-6	16	TAN
D-1	18	BLACK
D-2	18	RED
D-2A	18	RED
D-3	18	PINK
D-4	18	WHITE
D-4A	18	WHITE
D-5	18	TAN
D-5A	18	TAN
D-6	18	LIGHT GREEN
D-6A	18	LIGHT GREEN
D-7	18	BROWN
D-7A	18	BROWN
D-8	18	DARK GREEN
D-8A	18	DARK GREEN
D-9	18	TAN
D-10	18	LIGHT GREEN
E-1	18	TAN
E-2	18	ORANGE
E-2A	18	ORANGE
E-2B	18	ORANGE
E-2C	18	ORANGE
E-2D	18	ORANGE
E-5A	18	ORANGE WITH TRACER
G-1	18	BLACK
G-2	18	VIOLET
G-4	18	LIGHT BLUE
G-5	18	DARK BLUE
G-6	18	GRAY
H-3	18	BLACK WITH TRACER
H-3A	18	BLACK
J-1	12	RED
J-2	16	DARK BLUE
J-3	18	BROWN
L-1	16	BLACK WITH TRACER
L-2	16	LIGHT GREEN
L-3	16	RED
L-4	16	BLACK
L-5	18	RED
L-6	18	YELLOW WITH TRACER
L-7	18	BLACK

CIRCUITS		
CIR.	GA.	COLOR
L-8	18	PINK
M-1	18	PINK
M-1A	18	PINK
M-1B	18	PINK
M-2	18	YELLOW
M-2A	18	YELLOW
M-2B	18	YELLOW
M-2C	18	YELLOW
M-2D	18	YELLOW
M-2E	18	YELLOW
M-2F	18	YELLOW
M-3	18	PINK
M-5	18	PINK
M-5A	16	PINK
P-1	18	LIGHT BLUE
P-2	18	LIGHT BLUE
Q-1	12	BLACK
Q-2	14	BLACK
Q-2A	14	BLACK
Q-3	14	RED WITH TRACER
Q-4	14	BLACK
R-6	12	BLACK
R-6A	12	BLACK
S-2	18	YELLOW
T-1	12	RED
T-2	12	BROWN
T-3	12	YELLOW
V-1	16	PINK
V-3	16	BLACK WITH TRACER
V-3A	16	BLACK
V-4	16	RED
V-4A	16	RED
V-5	16	YELLOW
V-5A	16	YELLOW
V-6	16	DARK BLUE
V-6A	16	DARK BLUE
V-9	16	BLACK
V-10	18	TAN WITH TRACER
X-1	16	RED
X-12	18	BLACK
X-21	18	GRAY

Fig. 6—Instrument Panel Wiring (Plymouth)



CIRCUITS		
CIR.	GA.	COLOR
B-2	18	WHITE
B-2A	18	WHITE
B-2B	18	WHITE
C-11	18	BLACK
C-12	20	WHITE
C-13	18	BLACK
C-13A	14	BLACK
C-14	14	BLACK
D-7	18	BROWN
D-7A	18	BROWN
D-7B	18	BROWN
D-8	18	DARK GREEN
D-8A	18	DARK GREEN
D-8B	18	DARK GREEN
G-4	18	LIGHT BLUE
L-7	18	BLACK
L-7A	18	BLACK
L-7B	18	BLACK
L-7C	18	BLACK
L-7D	18	BLACK
L-7E	18	BLACK
L-7F	18	BLACK
L-7G	18	BLACK
M-1	18	PINK
M-1A	18	PINK
M-1B	18	PINK
M-1C	18	PINK
M-1D	18	PINK
M-1E	18	PINK
M-1F	18	PINK
M-1G	18	PINK
M-2	18	YELLOW
M-2A	18	YELLOW
M-2B	18	YELLOW
M-2C	18	YELLOW
M-2D	18	YELLOW
M-2E	18	YELLOW
M-2F	18	YELLOW
M-2G	18	YELLOW
M-2H	18	YELLOW
M-2J	18	YELLOW
M-11	18	PINK
M-11A	18	PINK
M-12	18	YELLOW
T-1	12	RED
T-2	12	BROWN
T-2A	12	RED
T-3	12	YELLOW
T-3A	12	YELLOW
T-4	12	BLACK

LEGEND
WIRING SPLICE
INSULATORS VIEWED FROM TERMINAL SIDE
MALE FEMALE MALE FEMALE

64 x 44

Fig. 7—Body Wiring (Except Station Wagon) Plymouth

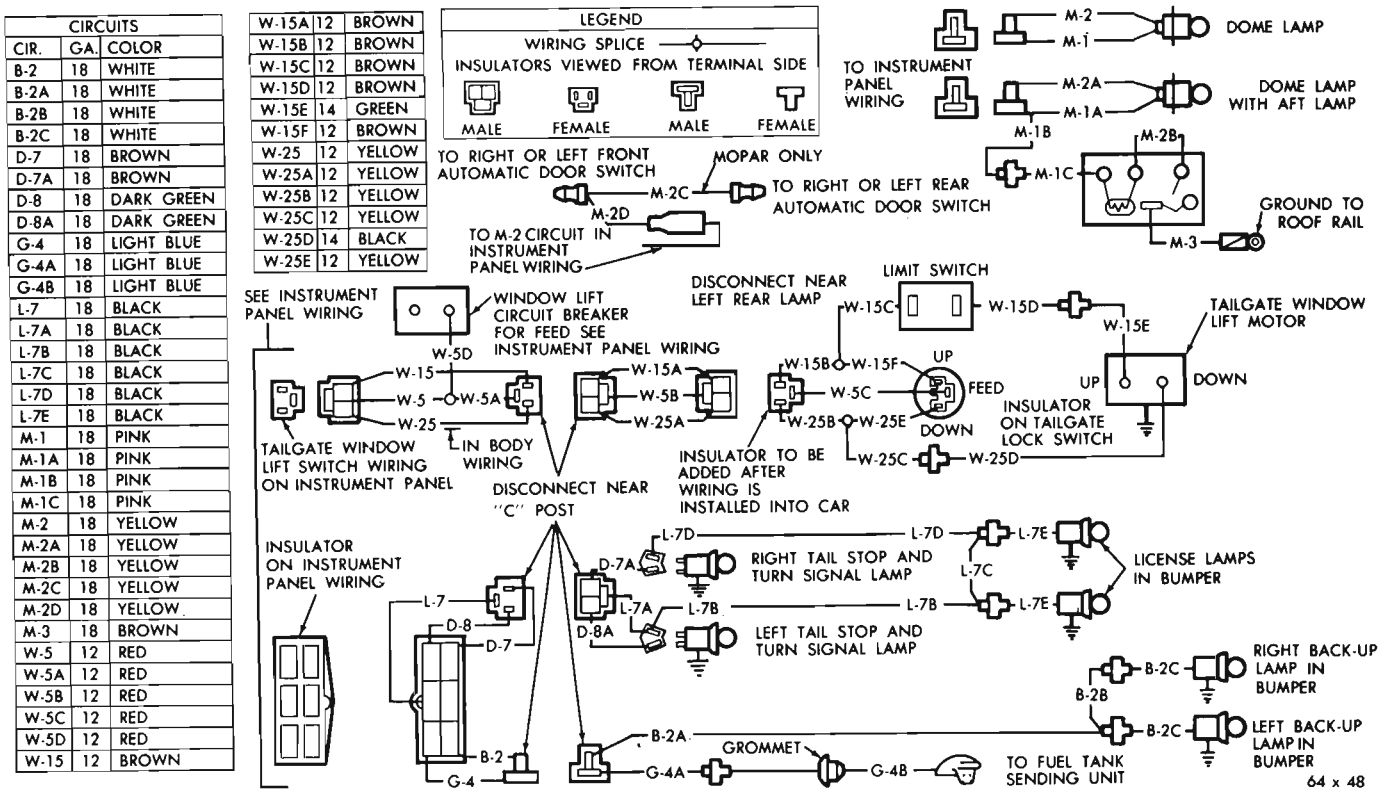


Fig. 8—Body Wiring (Station Wagon) Plymouth

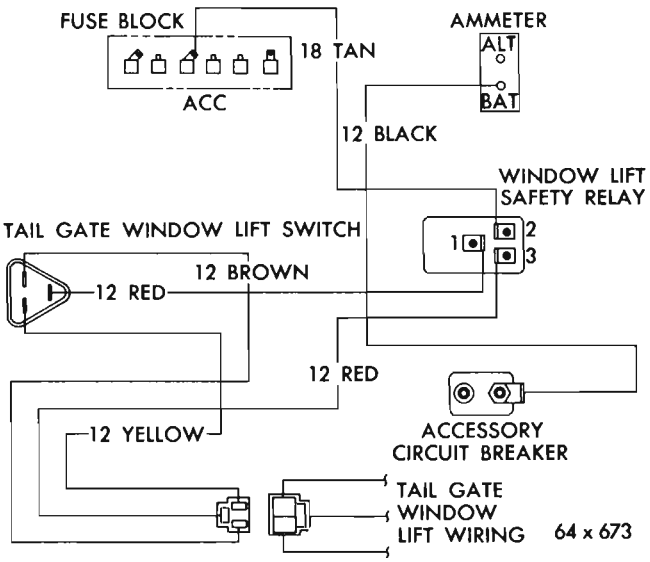


Fig. 9—Tail Gate Window Lift Wiring (Plymouth-Valiant)

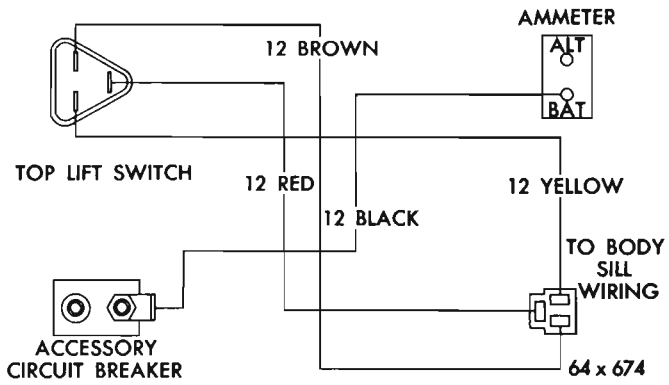
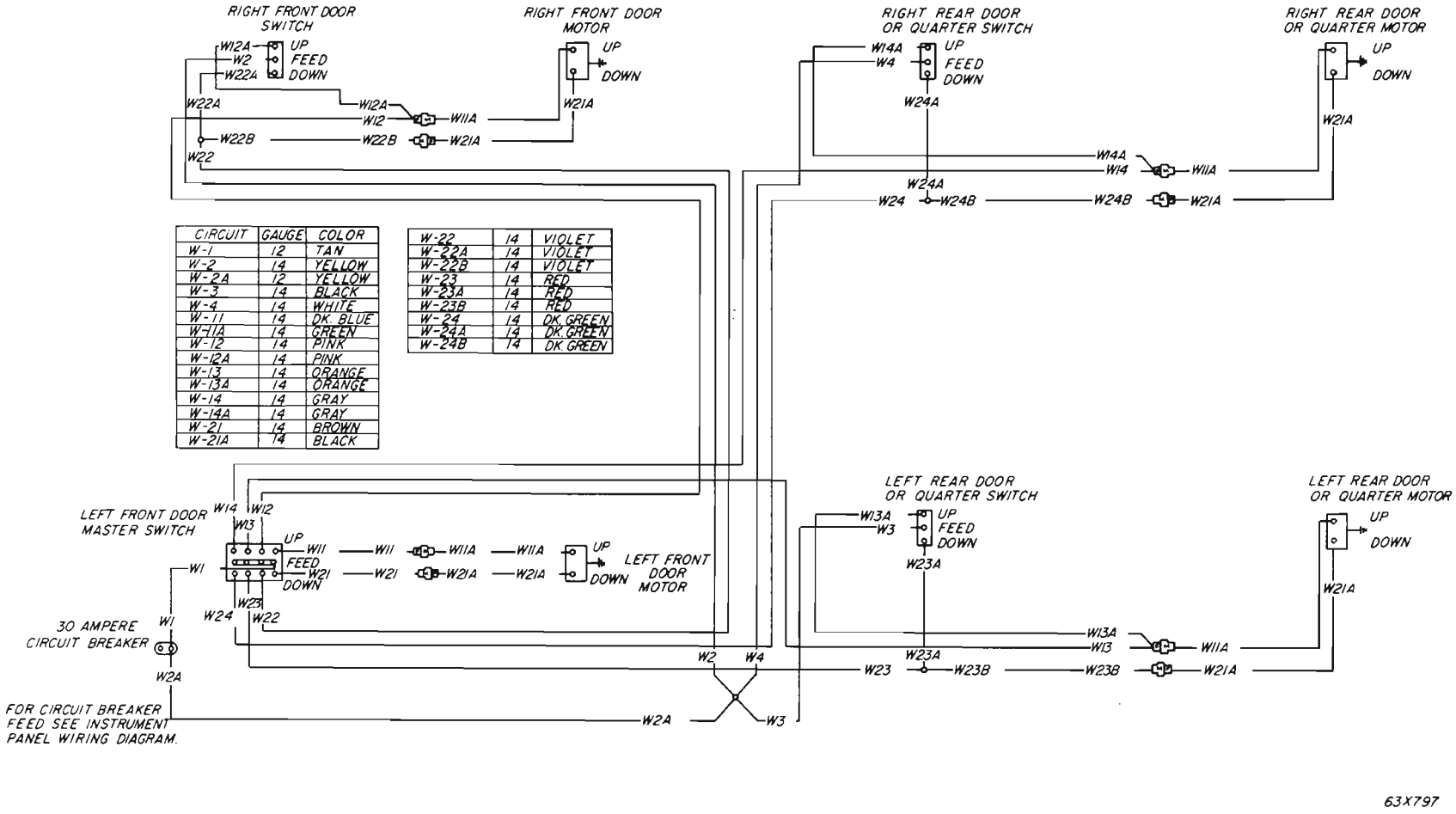


Fig. 10—Top Lift Switch Wiring (Plymouth-Valiant)



CIRCUIT	GAUGE	COLOR
W-1	12	TAN
W-2	14	YELLOW
W-2A	12	YELLOW
W-3	14	BLACK
W-4	14	WHITE
W-11	14	DK. BLUE
W-11A	14	GREEN
W-12	14	PINK
W-12A	14	PINK
W-13	14	ORANGE
W-13A	14	ORANGE
W-14	14	GRAY
W-14A	14	GRAY
W-21	14	BROWN
W-21A	14	BLACK

W-22	14	VIOLET
W-22A	14	VIOLET
W-22B	14	VIOLET
W-23	14	RED
W-23A	14	RED
W-23B	14	RED
W-24	14	DK. GREEN
W-24A	14	DK. GREEN
W-24B	14	DK. GREEN

Fig. 11—Electric Window Lift Wiring (Plymouth)

GROUP 9
ENGINE

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170-225 CUBIC INCH 6-CYLINDER ENGINES

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SPECIFICATIONS

Model Application	Engine Names	No. Cyl.	Valve Arrangement	Engine Type & Displacement
Valiant				
VV1 (Std.)	Standard 170	6	O.H.V.	"G" 170 Cubic Inch
VV1 (Opt.)	Super 225	6	O.H.V.	"RG" 225 Cubic Inch
Plymouth				
VP1 (Std.)	30D Economy "6"	6	O.H.V.	"RG" 225 Cubic Inch
VP2 (Std.)	Fury V-800	8	O.H.V.	"A" 318 Cubic Inch
VP2 (Opt.)	Commando "361"	8	O.H.V.	"B" 361 Cubic Inch
VP2 (Opt.)	Commando "383"	8	O.H.V.	"B" 383 Cubic Inch
VP2 (Opt.)	Commando "426"	8	O.H.V.	"B" 426 Cubic Inch
VP2 (Opt.)	Police	8	O.H.V.	"B" 413 Cubic Inch

SIX CYLINDER ENGINE

SPECIFICATIONS
(170-225 CUBIC INCH ENGINE)

ENGINE	
Type	In-Line OHV
Number of Cylinders	6
Bore	3.40"
Stroke—170 Cubic Inch	3.125"
225 Cubic Inch	4.125"
Piston Displacement	170—225 Cu. In.
Compression Ratio—170 Cubic Inch	8.50 to 1
225 Cubic Inch	8.40 to 1
Compression Pressure with Engine Warm, Spark Plugs Removed, Wide Open Throttle, at a Minimum Cranking Speed of 130 RPM	110—140 psi
Maximum Variation Between Cylinders (any one engine)	20 psi
Firing Order	1-5-3-6-2-4
Basic Timing	2½° B.T.D.C.
CRANKSHAFT	
Type	Fully Counter-Balanced
Bearings	Steel-Backed Babbitt
Main Bearing Journal Diameter	2.7495 to 2.7505"
Connecting Rod Journal Diameter	2.1865 to 2.1875"
Maximum Out-Of-Round Permissible	.001"
Number Main Bearings	4
Clearance Desired	.0005 to .0015"
Maximum Clearance Allowable Before Reconditioning	.0025"
End Play	.002 to .007"
Thrust Taken By	No. 3 Main Bearing
Finish at Rear Seal Surface	Diagonal Knurling
Interchangeability of Bearings	Upper Nos. 2, 4 Lower Nos. 1, 2, 4
MAIN BEARINGS (service)	
All available in Standard and the following Undersizes	.001, .002, .003, .010, .012"

SPECIFICATIONS—(Continued)

CONNECTING RODS AND BEARINGS	
Type	Drop Forged "I" Beam
Length (Center to Center)	170—5.705 to 5.709"
	225—6.697 to 6.701"
Weight (Less Bearing Shells)	170—25.3 oz.
	225—26.8 oz.
Bearings	Steel-Backed Babbitt
Diameter and Length	2.1870 x 1.015"
Clearance Desired	.0005 to .0015"
Maximum Allowable before Reconditioning	.0025"
Side Clearance	.006 to .012"
Bearings for Service	Standard .001, .002, .003, .010, .012" U.S.
Piston Pin Bore Diameter	.8995 to .9000"
CAMSHAFT	
Drive	Chain
Bearings	Steel-Backed Babbitt
Number	4
Thrust Taken by	Cylinder Block
Clearance	.001 to .003"
Maximum Allowable Before Reconditioning	.005"
CAMSHAFT BEARING JOURNALS	
Diameter	
No. 1	1.998 to 1.999"
No. 2	1.982 to 1.983"
No. 3	1.967 to 1.968"
No. 4	1.951 to 1.952"
CAMSHAFT BEARINGS	
Diameter (after reaming)	
No. 1	2.000 to 2.001"
No. 2	1.984 to 1.985"
No. 3	1.969 to 1.970"
No. 4	1.953 to 1.954"
TIMING CHAIN	
Number of Links	50
Pitch	.50"
Width	.88"
TAPPETS	
Type	Mechanical
Clearance in Block	.0012 to .0025"
Body Diameter	.9040 to .9045"
Clearance between Valve Stem and Rocker Arm Pad (Engine Hot)	.010" Intake
	.020" Exhaust
PISTONS	
Type	Horizontal Slot w/Steel Struts
Material	Aluminum Alloy Tin Coated
Land Clearance (diametral)	.024 to .031"
Clearance at Top of Skirt	.0005 to .0015"
Weight (std. through .040 oversize)	16 oz.
Piston Length (overall)	3.51"

SPECIFICATIONS—(Continued)

PISTONS Cont'd	
Ring Groove Depth	
No. 1	.179"
No. 2	.179"
No. 3	.181"
Pistons for Service	Std. .005, .020, .040" O.S.
PISTON PINS	
Type	Press Fit in Rod
Diameter	.9007—.9009"
Length	2.955—2.976"
Clearance in Piston	.00045 to .00075"
Interference in Rod	.0007 to .0012"
Piston Pins for Service	Standard Only
Direction Offset in Piston	Toward Right Side of Engine
PISTON RINGS	
Number of Rings per Piston	3
Compression	2
Oil	1
Width of Rings	
(Compression)	.0775 to .0780"
(Oil)	.1860 to .1865"
Piston Ring Gaps (Compression)	.010 to .020"
Service Rings (Oil Control)	.015 to .062"
RING SIDE CLEARANCE (SERVICE RINGS)	
(Compression)	
Upper	.0015 to .0040"
Intermediate	.0015 to .0040"
(Oil)	.009" Maximum
VALVES—Intake	
Material	Carbon Manganese Steel
Head Diameter	1.615—1.625"
Length (to gage dim. Line)	4.6878—4.7028"
Stem Diameter	.372 to .373"
Stem to Guide Clearance	.001 to .003"
Maximum Allowable Before Reconditioning	.004"
Valve Face Angle	45°
Adjustment	Rocker Arm Screw
Lift	.375"
VALVES—Exhaust	
Material	Nitrogen Treated Manganese Chromium Nickel Steel
Head Diameter	1.355—1.365"
Length (to gauge dim. Line)	4.6878—4.7028"
Stem Diameter	.371 to .372"
Stem to Guide Clearance	.002 to .004"
Maximum Allowable Before Reconditioning	.006"
Valve Face Angle	47°
Adjustment	Rocker Arm Screw
Lift	.360"

SPECIFICATIONS—(Continued)

VALVE SPRINGS	
Number	12
Free Length	1.92"
Load when Compressed to (valve closed)	49—57 lbs. @ 1 1/16"
Load when Compressed to (valve open)	137—150 lbs. @ 1 5/16"
Valve Springs I.D.	1.010 to 1.030"
CYLINDER HEAD	
Combustion Chamber	Wedge Type
Valve Seat Run-Out (maximum)	.002"
Intake Valve Seat Angle	45°
Seat Width (finished)	.070 to .090"
Exhaust Valve Seat Angle	45°
Seat Width (finished)	.040 to .060"
Cylinder Head Gasket Compressed (thickness)	.022"
CYLINDER BLOCK	
Cylinder Bore (standard)	—
Cylinder Bore Out-of-Round (Max. allowable before reconditioning)	.005"
Cylinder Bore Taper (Max. allowable before reconditioning)	.010"
Reconditioning Working Limits (for taper and out-of-round)	.001"
Maximum Allowable Oversize Cylinder Bore	.040"
Tappet Bore Diameter	.9050—.9058"
Distributor Lower Drive Shaft Bushing (press fit in block)	.0005—.0040"
Ream to	.4865—.4880"
Shaft to Bushing Clearance	.0007—.0027"
ENGINE LUBRICATION	
Pump Type	Rotary, Full Pressure
Capacity (qts.)	4*
Pump Drive	Camshaft
Operating Pressure at 1000 RPM	45 to 60 lbs.
Pressure Drop Resulting from Clogged Filter	7 to 9 lbs.
OIL FILTER	
Type	Full Flow
Spin On	Replaceable

*When Filter Element is Replaced, Add 1 qt.

OIL PUMP—INSPECTION LIMITS FOR REPLACEMENT

Oil Pump Cover	.0015 inch or more
Outer Rotor Length	.649 inch or more
Outer Rotor Diameter	2.469 inch or less
Inner Rotor Length	.649 or less
Clearance Over Rotors—Outer	.004 inch or more
Inner	.004 inch or more
Outer Rotor Clearance	.012 inch
Tip Clearance Between Rotors	.010 inch or more

OVERSIZE AND UNDERSIZE ENGINE COMPONENT MARKINGS

Engine Displacement	Condition	Identification	Location of Identification
170 cu. in. 225 cu. in.	.001" U/S Crankshaft	Maltese Cross	Top of front pad—Right side of block
		M-2-3 etc. (indicating No. 2 & 3 main bearing journal) and/or R-1-4 etc. (indicating No. 1 & 4 connecting rod journals)	Crankshaft counterweight
	.010" U/S Crankshaft	X	Top of front pad—Right side of block
		M-10 (indicates .010" U/S all main journals) and/or R-10 (indicates .010" U/S all rod journals)	Crankshaft counterweight
	.020" O/S Cylinder Bores	A	Top of front pad—Right side of block
	.008" O/S Tappets	♦	Top of front pad—Right side of block

SPECIAL TOOLS 170-225 CUBIC INCH ENGINES

C-119 ..... Cylinder Bore Gauge
C-385 ..... Ring Compressor
C-647 ..... Spring Testing Fixture
C-756 ..... Valve Guide Cleaner
C-771 ..... Flywheel Turning Tool
C-823 ..... Cylinder Bore Hone
C-897 ..... Welch Plug Driver
C-3005 ..... Torque Wrench 100 Foot-Pounds (sensory type)
C-3012 ..... Cylinder Ridge Reamer
C-3025 ..... Intake Valve Guide Wear Checking Sleeve
C-3026 ..... Exhaust Valve Guide Wear Checking Sleeve
C-3028 ..... Tappet Bore Reamer
C-3059 ..... Main Bearing Upper Shell Remover and Installer
C-3065 ..... Cylinder Compression Gauge
C-3066 ..... Timing Light Connector
C-3068 ..... Tappet and Push Rod Carrier
C-3132A ..... Camshaft Bearing Remover and Installer
C-3167 ..... Engine Repair Stand
C-3221 ..... Piston and Connecting Rod Remover and Installer
C-3339 ..... Dial Indicator Set
C-3422(A) ..... Valve Spring Compressor
C-3427 ..... Valve Guide Reamer .030" Oversize

SPECIAL TOOLS-170-225 CUBIC INCH ENGINES—(Continued)

C-3430	Valve Guide Reamer .015" Oversize
C-3433	Valve Guide Reamer .005" Oversize
C-3487	Engine Support Fixture
C-3501	Cylinder Bore Deglazing Hone
C-3506	Chain Case Cover Oil Seal Removing and Installing Tool
C-3626	Cylinder head Holding Fixture
C-3661	Tappet Remover
C-3662	Engine Repair Stand Adapter
C-3724	Piston Pin Removing and Installing Tool
C-3732A	Vibration Damper Puller-Installer
C-3743	Rear Main Bearing Oil Seal Installing Tool
C-3746	Valve Stem Length Gauge
C-3804	Engine Lifting Fixture
C-3805	Piston Ring Remover and Installer
C-3806	Fixture to Adapt C-3487 to Six Cylinder Engine

TORQUE REFERENCE—170-225 CUBIC INCH ENGINES

	Torque Foot-Pounds	Thread Size
Connecting Rod Nut	45	3/8-24
Cylinder Head Bolt	65	7/16-14
Main Bearing Cap Bolt	85	1/2-13
Spark Plug	30	14mm
Camshaft Lockbolt	35	7/16-14
Carburetor to Manifold Nut	30	3/8-16
Chain Case Cover Bolt	200 in.-lbs.	5/16-18
Torque Converter Housing Bolt	30	3/8-16
Converter Brace to Aluminum Housing	40	7/16-14
Converter Brace to Engine Block	30	3/8-16
Clutch Housing Bolt	30	3/8-16
Crankshaft Rear Bearing Seal Retainer	30	3/8-16
Cylinder Head Cover Bolt	40 in.-lbs.	1/4-20
Distributor Clamp Bolt	200 in.-lbs.	5/16-18
Engine Front Mounting to Frame Nut	85	1/2-20
Engine Front Mounting to Block Nut	45	7/16-20
Engine Rear Mount Bolts	35	7/16-14 3/8-24
Exhaust Manifold Nut	10	5/16-24
Exhaust Pipe Flange Nut	30	7/16-20
Exhaust Pipe Clamp Bolt	20	3/8-24
Exhaust Pipe Support Clamp Bolt	20	3/8-24
Fan Attaching Bolt	200 in.-lbs.	5/16-18
Flywheel Housing to Cylinder Block Bolt	50	7/16-14
Flywheel Housing Cover Bolt	7	1/4-20
Fuel Pump Attaching Bolt	30	3/8-16
Alternator Bracket Bolt	30	3/8-16
Alternator Mounting Nut	200 in.-lbs.	5/16-18
Alternator Adjusting Strap Bolt	15	5/16-18
Alternator Adjusting Strap Mounting Bolt	30	3/8-16
Intake to Exhaust Manifold Bolt	200 in.-lbs.	5/16-18
Manifold Heat Control Counterweight Bolt	50 in.-lbs.	10-32
Oil Pan Drain Plug	20	1/2-20
Oil Pan Bolt	200 in.-lbs.	5/16-18
Oil Pump Cover Bolt	130 in.-lbs.	1/4-20
Oil Pump Attaching Bolt	200 in.-lbs.	5/16-18
Oil Filter Attaching Stud	30	3/4-16
Oil Pressure Gauge Sending Unit	60 in.-lbs.	1/8 N.P.T.F.
Rocker Shaft Bracket Bolt	30	3/8-16
Starter Mounting Bolt	50	7/16-14
Temperature Gauge Sending Unit	180 in.-lbs.	1/4 N.P.T.F.
Water Pump to Housing Bolt	30	3/8-16

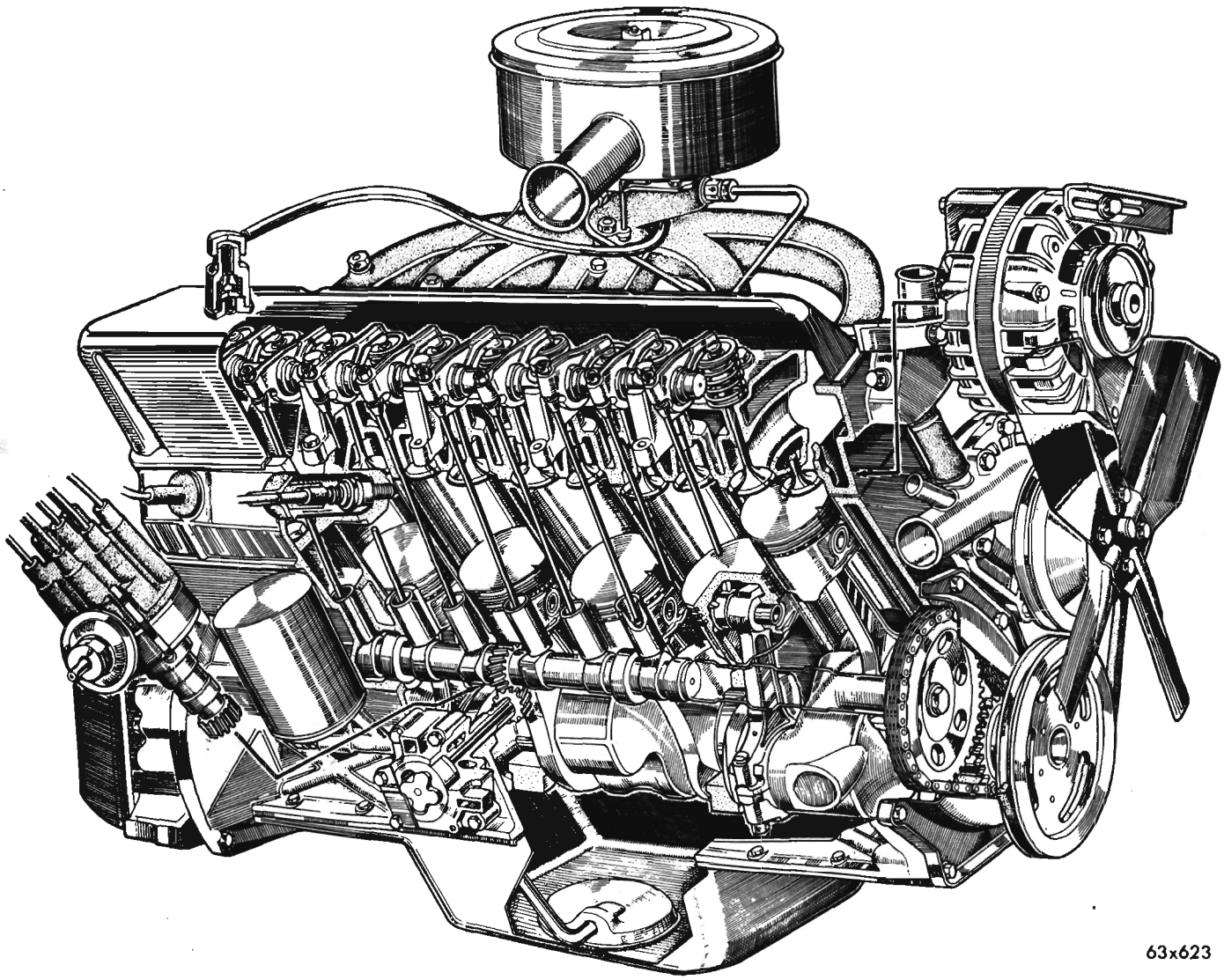
PART I

SIX CYLINDER ENGINE

The 6 cylinder engine, as shown in Figure 1 is inclined toward the right at an angle of 30 degrees from the vertical in the engine compartment. This design permits a lower hood line and allows space in the engine compartment for the long intake manifold branches. The engine has in-line overhead valves and wedge shaped combustion chambers and a nominal compression ratio of 8.5:I for the 170 cu. in. engine and 8.4:I for the 2 25 cu. in. engine.

The lubrication system consists of an externally mounted rotor type pump on the lower right side of the cylinder block. A full flow replaceable element type oil filter is mounted on the rear of the oil pump body. Oil is forced by the oil pump to a series of oil passages in the engine, as shown in Figure 2.

The semi-series flow cooling system contains an aluminum water pump body with a pressed in ball bearing and seal assembly and plastic impeller. The water pump housing is integral with the cylinder block.



63x623

Fig. 1—Engine End Sectional View

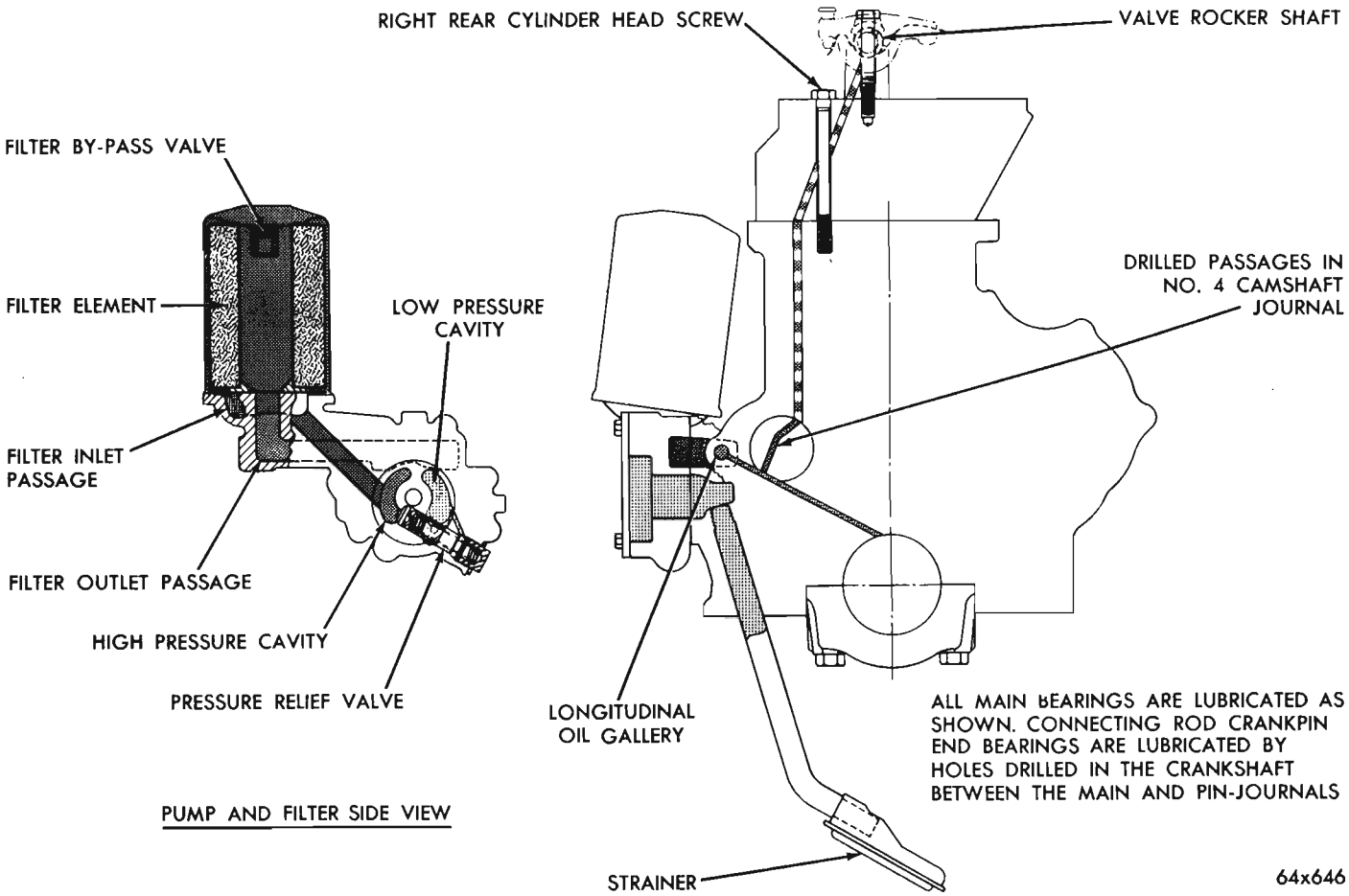


Fig. 2—Engine Oiling System

SERVICE PROCEDURES

1. TUNE-UP

(1) Test the battery specific gravity, add water if necessary, clean and tighten the battery connections.

(2) Test the cranking voltage if below 9.6 volts and more than 130 amperes draw. See "Starting Motor Cranking Voltage" Electrical Group 8.

(3) Tighten the intake manifold bolts to 15 foot-pounds torque.

(4) Perform the cylinder compression test. The compression should not vary more than 20 pounds for any one engine.

(5) Clean or replace spark plugs as necessary and adjust gap to .035 inch. Tighten to 30 foot-pounds torque.

(6) Test the resistance of the spark plug cables and if the resistance is more than 30,000 ohms replace the cable.

(7) Remove the distributor. Clean the cap and rotor. Inspect for carbon tracking, cracks and corrosion. Inspect the breaker plate, points, lead wire and vacuum advance, replace if necessary. Adjust to specifications. Test coil and condenser.

(8) Install the distributor, distributor cap, and spark plug cables. Reset the ignition timing with the vacuum advance line disconnected. The ignition timing should be set to compensate for altitudes and/or gasoline grades as follows:

A. At low altitudes, with any good grade of the recommended gasoline, either "regular" or "premium", the engine will give its best performance if timed according to specifications.

B. When using lower grade fuels, or after carbon has accumulated, objectionable spark ping may occur with the specified timing. In cases of this nature, ignition timing should be retarded, but not to exceed

5 degrees of crankshaft rotation later than specified.

C. At high altitudes or when using higher quality gasoline, for example "premium" where "regular" is specified or "super premium" where premium is specified, there is less tendency for spark ping. In such cases, improved performance may be obtained by advancing the spark not to exceed 5 degrees of crankshaft rotation ahead of specified timing.

NOTE: It is recommended, however, that vehicles operating at high speeds or hauling trailers have ignition timing set at not over the specified setting.

D. Within the foregoing limits, namely, from 5 degrees ahead to 5 degrees later than specified timing, a good rule to follow is to advance the spark until a slight ping is heard when accelerating from 15 mph in direct drive at wide open throttle.

(9) Set carburetor idle mixture adjustment. Adjust the throttle stop screw to specifications. Perform a combustion analysis.

(10) Test the fuel pump for pressure and vacuum. Refer to "Fuel System" Group 14, Specifications.

(11) Inspect the manifold heat control valve in the exhaust manifold for proper operation and apply Manifold Heat Control Valve Solvent Part Number 1879318 to the bushing and shaft.

(12) Every 6 months remove the filter element and blow out dirt gently with an air hose. Direct air from inside out, and keep noozle 2 inches away from the element to avoid damaging. Clean the metal housing and replace the element. Every 32,000 miles, install a new factory recommended MoPar filter element. Service the unit more frequently when driving under severe conditions, such as in dusty areas. Fig. 3.

(13) Inspect and adjust the accessory belt drives referring to Cooling System, Group 7 for proper adjustments.

(14) Road test the vehicle as a final test.

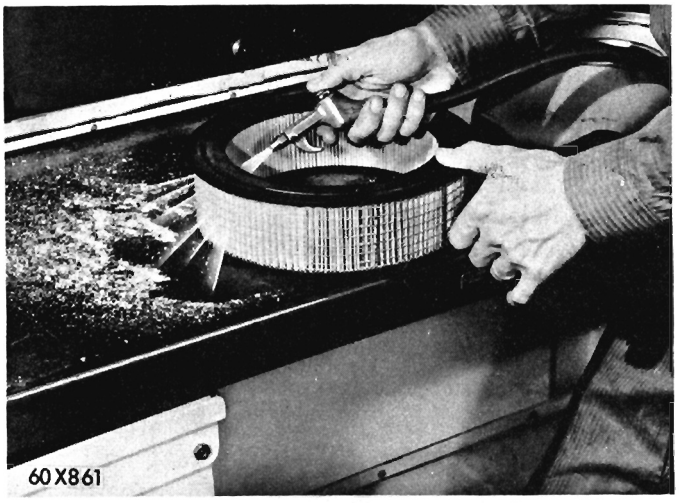


Fig. 3—Cleaning Filter Element

2. ENGINE REPLACEMENT

Removal

(1) Scribe the hood hinge outlines on the hood and remove the hood.

(2) Drain the cooling system and remove the battery and the carburetor air cleaner.

(3) Remove the radiator and heater hoses and remove the radiator.

(4) Remove the closed vent system from the cylinder head cover.

(5) Disconnect the fuel lines, carburetor linkage and wiring to the engine.

(6) Disconnect the exhaust pipe at the manifold.

(7) Raise the vehicle on a hoist.

(8) Drain the converter housing and the transmission. Remove the oil cooler lines, filler tube and push button cable. (If so equipped).

(9) Remove the clutch torque shaft, brake cables and rods.

(10) Remove the speedometer cable and the gear shift rods.

(11) Disconnect the propeller shaft and tie-up out of way.

(12) Install the engine support fixture Tool C-3806 to support the rear of the engine.

(13) Remove the engine rear support crossmember (Figs. 4 and 5).

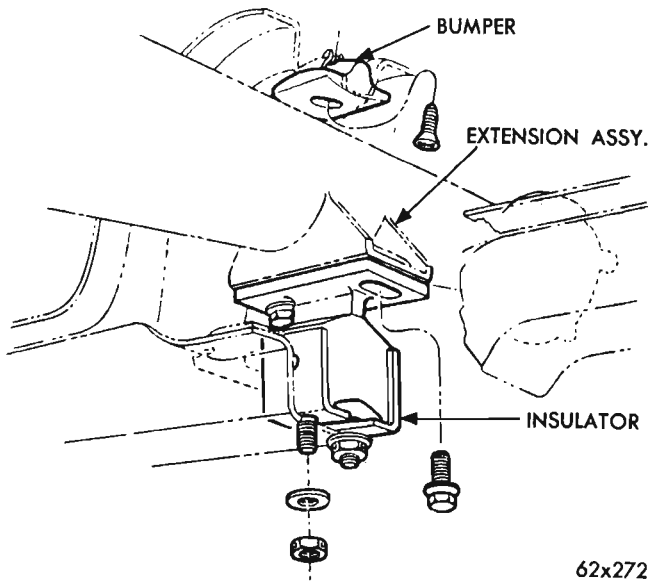


Fig. 4—Rear Engine Mount (Valiant)

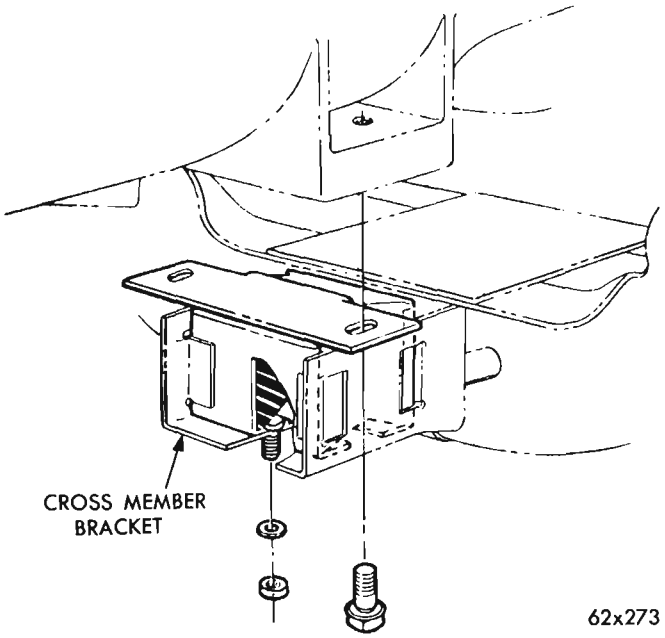


Fig. 5—Rear Engine Mount (Plymouth)

(14) Remove the transmission bolts from the clutch housing.

(15) Remove the transmission.

(16) Lower the vehicle.

(17) Install the engine lifting fixture Tool C-3804 to the cylinder head and attach a chain hoist to the fixture eyebolt.

(18) Remove the engine support fixture.

(19) Remove the front engine mount bolts (Figs. 6 and 7).

(20) Lift the engine from the engine compartment and install on an engine repair stand.

Installation

(1) Install the engine lifting fixture Tool C-3804 and attach a chain hoist to the fixture eyebolt.

(2) Lower the engine into the engine compartment until the front of the engine is positioned on the front engine mounts.

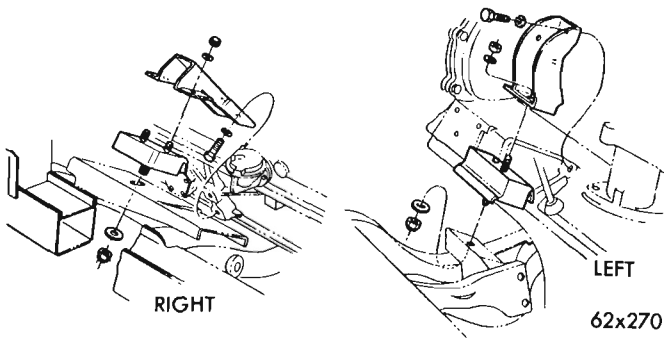


Fig. 6—Front Engine Mounts (Valiant)

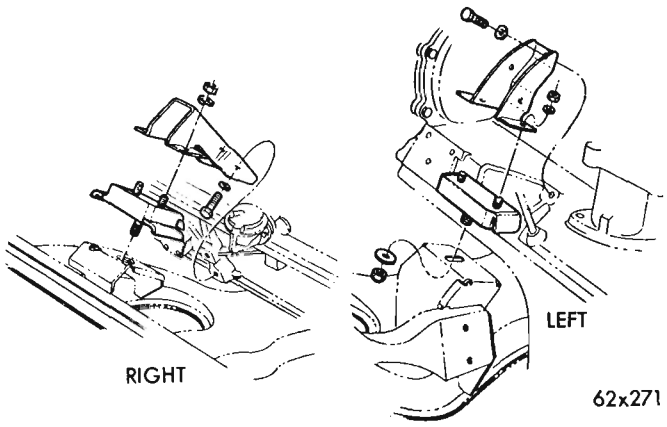


Fig. 7—Front Engine Mounts (Plymouth)

(3) Install the front engine mount bolts. **Do not tighten.**

(4) Install the engine support fixture Tool C-3806.

(5) Remove the chain hoist and engine lifting fixture.

(6) Raise the vehicle on a hoist.

(7) Position the rear of engine and install the transmission.

(8) Install the engine rear support crossmember.

(9) Connect the propeller shaft at the transmission.

(10) Install the speedometer cable and gear shift rods.

(11) Install the clutch torque shaft, brake cables and rods.

(12) Install the cooler lines, and transmission filler tube.

(13) Lower the vehicle.

(14) Tighten the front engine mount bolts to 85 foot-pounds torque.

(15) Connect the exhaust pipe at the manifold using a new gasket.

(16) Connect the fuel lines, carburetor linkage and wiring to the engine.

(17) Install the closed vent system on the cylinder head cover.

(18) Install the radiator hoses, battery and carburetor air cleaner.

(19) Fill the cooling system and the transmission.

(20) Install the hood.

3. CYLINDER HEAD

The chrome alloy cast iron cylinder head, as shown in Figure 8 is held in place by 14 bolts. The

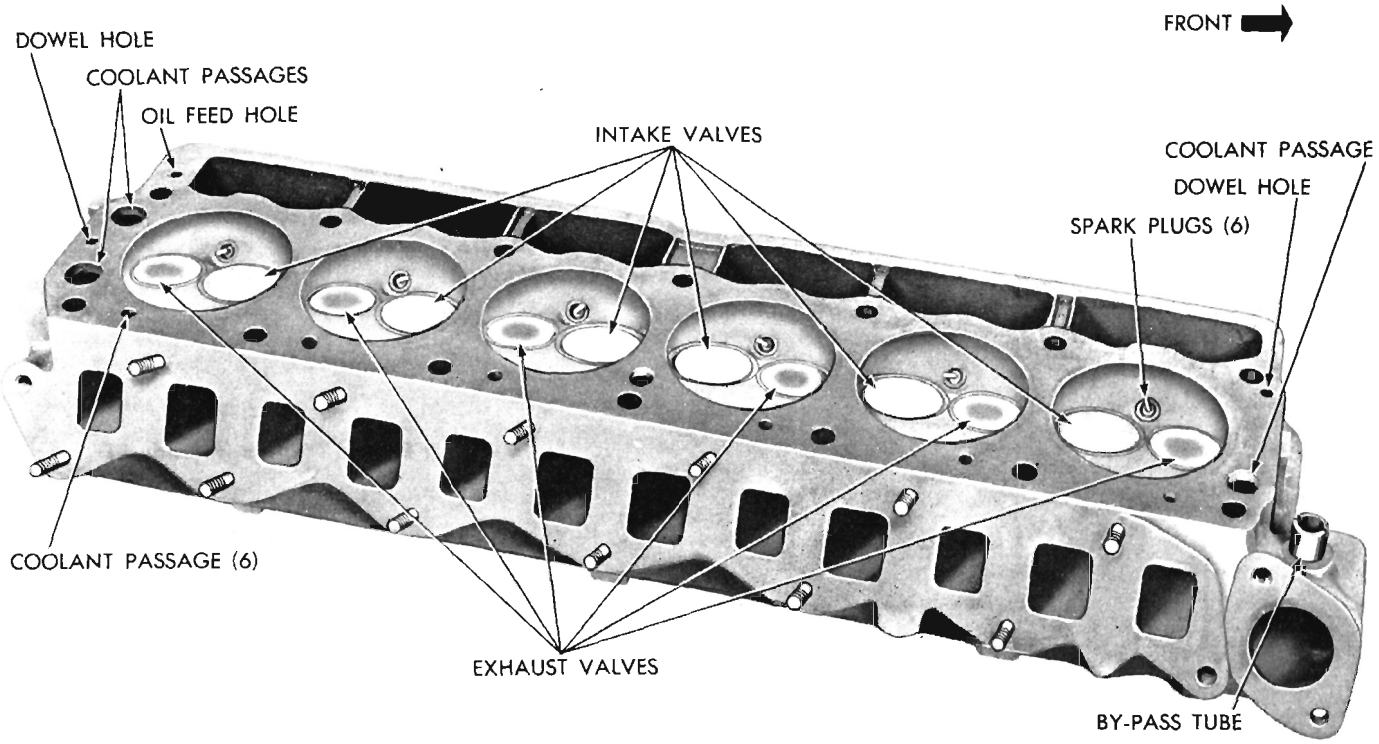


Fig. 8—Cylinder Head

spark plugs are located at the wide edge of the combustion chambers and aluminum spark plug tubes serve as spark plug gaskets.

Removal

(1) Drain the cooling system.

(2) Remove the carburetor air cleaner and fuel line.

(3) Disconnect the accelerator linkage.

(4) Remove the vacuum control tube at the carburetor and distributor.

(5) Disconnect the spark plug wires by pulling straight out in line with the plug.

(6) Disconnect the heater hose and clamp holding the by-pass hose.

(7) Disconnect the heat indicator sending unit wire.

(8) Disconnect the exhaust pipe at the exhaust manifold flange.

(9) Remove the intake and exhaust manifold and carburetor as an assembly.

(10) Remove the closed vent system and the cylinder head cover.

(11) Remove the rocker arms and shaft assembly.

(12) Remove the push rods and place them in their respective slots in holder, Tool C-3068.

(13) Remove 14 head bolts and remove the cylinder head.

(14) Place the cylinder head in holding fixture Tool C-3626 and remove the spark plugs and tubes.

Installation

(1) Clean all gasket surfaces of the cylinder block and cylinder head and install spark plugs.

(2) Inspect all surfaces with a straight edge if there is any reason to suspect leakage.

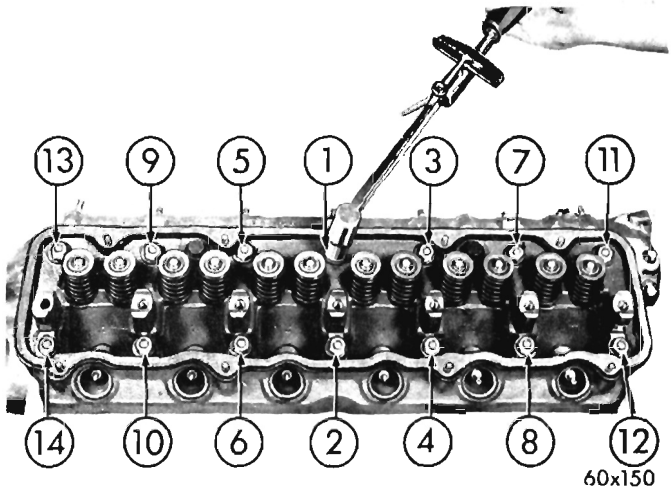


Fig. 9—Cylinder Head Tightening Sequence

(3) Coat the new gasket with MoPar Sealer, Part Number 1122893. Install the gasket and the cylinder head.

(4) Install the cylinder head bolts. Starting at the top center, tighten all cylinder head bolts to 65 foot-pounds torque in sequence (Fig. 9). Repeat the procedure, retightening all cylinder head bolts to 65 foot-pounds torque.

(5) Install the rocker arms and shaft assembly with "FLAT" on the end of the rocker shaft "ON TOP" and pointing toward the front of the engine, as shown in Figure 10 to provide proper lubrication to the rocker assemblies. **Install the rocker shaft retainers between the rocker arms so they seat on the rocker shaft and not on the extended bushing of the rocker arm.** Be sure to install the long retainer in the center position only. Install the rocker shaft bolts (long bolt at rear of engine) and tighten to 30 foot-pounds torque.

(6) Loosen the 3 bolts holding the intake manifold to the exhaust manifold. This is required to maintain proper alignment.

(7) Install the intake and exhaust manifold and the carburetor assembly to the cylinder head with the cup side of the conical washers against the manifolds. Tighten nuts to 10 foot-pounds torque.

(8) Tighten 3 bolts holding the intake manifold to the exhaust manifold to 15 foot-pounds torque.

NOTE: Sequence: Tighten inner bolt first, then the outer two bolts.

(9) Connect the heater hose and by-pass hose clamp.

(10) Connect the heat indicator sending unit wire, the accelerator linkage and spark plug wires.

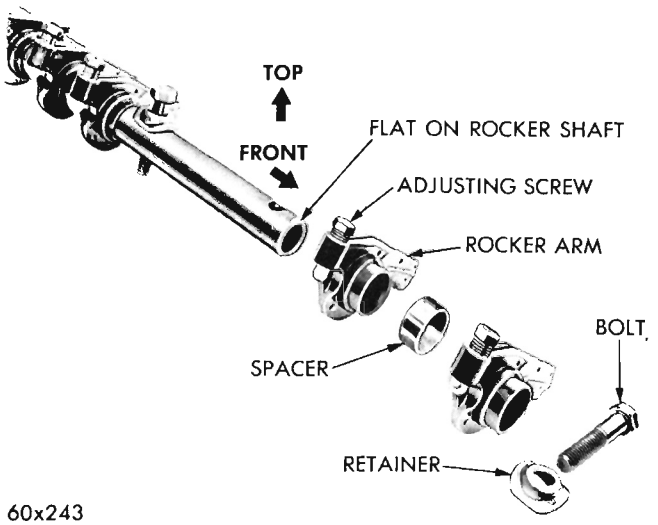


Fig. 10—Rocker Shaft Installed

(11) Install the vacuum control tube from the carburetor to the distributor.

(12) Connect the exhaust pipe to the exhaust manifold flange.

(13) Install the fuel line and the carburetor air cleaner.

(14) Fill the cooling system.

(15) Operate the engine until normal operating temperature is reached (approximately 180° F. water temperature).

(16) Allow the engine to idle at 550 rpm at this 180° F. temperature for five minutes.

(17) Adjust the intake valves to .010 inch clearance and the exhaust valves to .020 inch.

(18) Place the new cylinder head cover gasket in position and install the cylinder head cover. Tighten nuts to 40 inch-pounds torque.

(19) Install the closed vent system.

4. ROCKER ARMS AND SHAFT ASSEMBLY

Stamped steel rocker arms are arranged on a single rocker arm shaft. Hardened steel spacers are used between the pairs of rocker arms. The rocker shaft is held in place by bolts and stamped steel retainers attached to the seven brackets on the cylinder head.

Removal

(1) Remove the closed vent system.

(2) Remove the cylinder head cover and gasket.

(3) Remove the rocker shaft bolts and retainers.

(4) Remove the rocker arms and shaft assembly.

Installation

(1) The rocker arms and shaft assembly must be installed, as shown in Figure 10. The flat on the end of the rocker shaft must be on top and point toward the front of the engine. This is necessary to provide proper lubrication to the rocker assemblies.

(2) Install the rocker shaft retainers between the rocker arms so they seat on the rocker shaft and not on the extended bushing of the rocker arm.

Be sure to install the long retainer in the center position only.

(3) Install the rocker shaft bolts. Install the long bolt at the rear of the engine. Tighten to 30 foot-pounds torque.

(4) Adjust tappets. Hot; intake .010 inches, exhaust .020 inches.

5. VALVES AND VALVE SPRINGS

Valves are arranged in line in the cylinder head

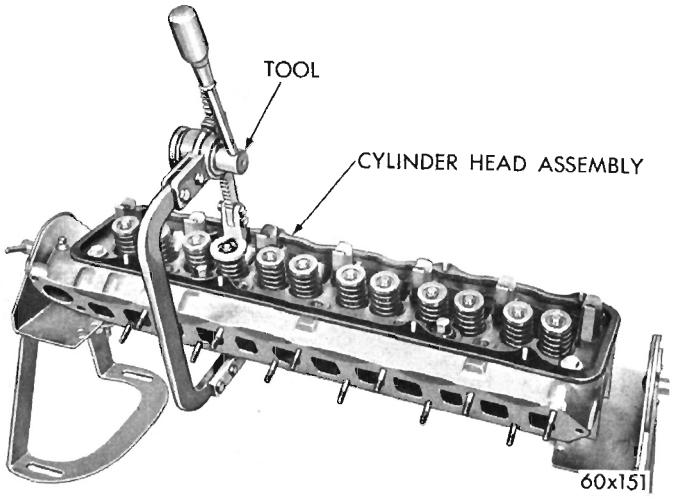


Fig. 11—Compressing Valve Spring (Tool C-3422A)

and operate in guides that are integral with the cylinder heads.

Removal

(1) With cylinder head removed, compress the valve springs, using Tool C-3422A (Fig. 11).

(2) Remove the valve retaining locks, valve spring retainers, valve stem cup seals and the valve springs.

NOTE: Remove any burrs from the valve stem lock grooves to prevent damage to the valve guide when the valves are removed.

Valve Inspection

(1) Clean the valves thoroughly and discard burned, warped and cracked valves.

(2) Measure the valve stems for wear. The intake valve stem diameter (new valve) should measure .372 to .373 inch and exhaust valve stem diameter (new valve) should measure .371 to .372 inch. If the wear exceeds .002 inch, replace the valve.

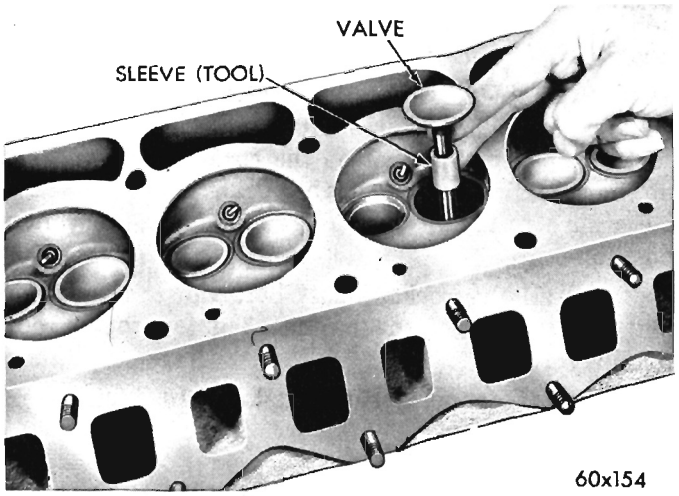


Fig. 12—Measuring Wear with Sleeve (Tool C-3026)

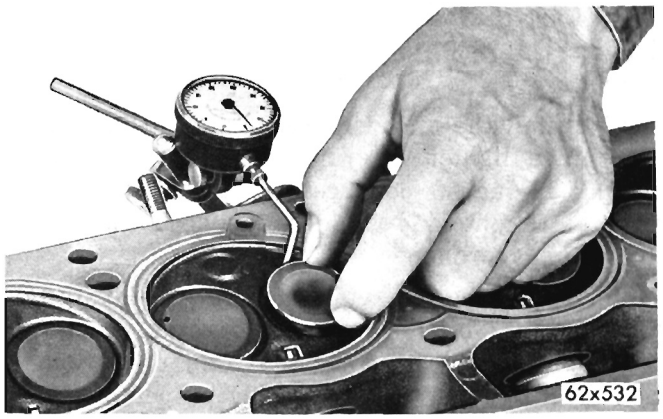


Fig. 13—Measuring Valve Guide Tool C-3339

(3) Remove carbon and varnish deposits from the inside of the valve guides, with Tool C-756.

(4) Measure the valve stem guide clearance as follows:

Install sleeve Tool C-3026 over the valve stem and install valve (Fig. 12). The special sleeve places the valve at the correct height for measuring with a dial indicator.

(5) Attach the dial indicator Tool C-3339 to the cylinder head and set it at right angle of the valve stem being measured (Fig. 13).

(6) Move valve to and from the indicator. The total dial indicator reading should not exceed .012 inch on intake valves and .017 inch on exhaust valves. Ream the guides for valves with oversize stems if the dial indicator reading is excessive or if the stems are scuffed or scored.

Service valves are available in standard, .005, .015 and .030 inch oversizes. Reamer to accommodate the oversize valve stem are as follows: Reamer

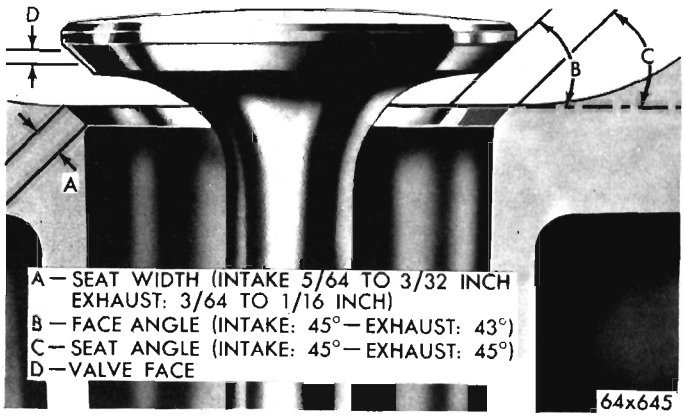


Fig. 14—Valve Face and Seat Angle

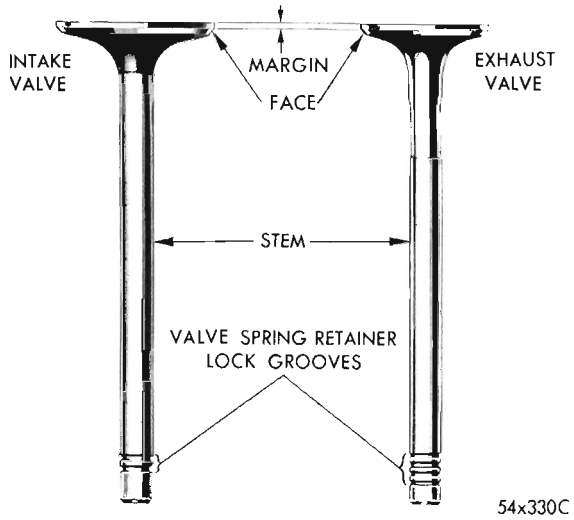


Fig. 15—Intake and Exhaust Valve

Tool C-3433 (.005" O.S.), Reamer Tool C-3430 (.015" O.S)., Reamer Tool C-3427 (.030" O.S.).

(7) Slowly turn reamer by hand and clean guide thoroughly before installing a new valve. **Do not attempt to ream the valve guides from standard directly to .030 inch. Use step procedure of .005, .015 and .030 inch so the valve guides may be reamed true in relation to the valve seat.**

6. REFACING VALVES AND VALVE SEATS

(1) The intake and exhaust valve seats and the intake valve face have a 45 degree angle. The exhaust valve face has a 43 degree angle. The valve face and valve seat angles, are shown in Figure 14.

(2) Inspect the remaining margin after the valves are refaced (Fig. 15). Valves with less than $\frac{3}{64}$ inch margin should be replaced.

(3) When refacing the valve seats, it is important that the correct size valve guide pilot be used for reseating stones. A true and complete surface must be obtained.

(4) Measure the concentricity of the valve seat using dial indicator No. 13725. The total runout should not exceed .002 inch (total indicator reading).

(5) Inspect the valve seat with Prussian blue to determine where the valve contacts the seat. To do this, coat the valve seat **lightly** with Prussian Blue then set the valve in place. Rotate the valve with light pressure. If the blue is transferred to the center of the valve face, the contact is satisfactory. If the blue is transferred to the top edge of the valve face, lower the valve seat with a 30° stone. If the blue is transferred to the bottom edge of the valve face raise the valve seat with a 60° stone.

(6) When the seat is properly positioned the width of the intake seats should be $\frac{5}{64}$ to $\frac{3}{32}$ inch. The width of the exhaust seats should be $\frac{3}{64}$ to $\frac{1}{16}$ inch.

7. TESTING VALVE SPRINGS

(1) Whenever the valves have been removed for inspection, reconditioning or replacement, the valve springs should be tested. To test a spring, determine the length at which the spring is to be tested. As an example, the compressed length of the spring tc be tested is $1\frac{5}{16}$ inches. Turn the table of Tool C-647 until the surface is in line with the $1\frac{5}{16}$ inch mark on the threaded stud and the zero mark to the front. Place the spring over the stud on table and lift the compressing lever to set the tone device. Pull on torque wrench until ping is heard. Take the reading on torque wrench at this instant. Multiply this reading by two. This will give the spring load at the test length. Fractional measurements are idicated on the table for finer adjustments. The valve springs should test 137 to 150 lbs. when compressed to $1\frac{5}{16}$ inches. Replace springs that do not meet these specifications.

(2) Inspect each valve spring for squareness with a steel square and surface plate, test springs from both ends, as shown in Figure 16.

If the spring is more than $\frac{1}{16}$ inch out of square, install a new spring.

Installation

(1) Coat the valve stems with lubrication oil and insert them in the cylinder head.

(2) If valves or seats are reground, test the valve stem height with Tool C-3746. If the valve is too long, grind off the tip until the length is within the limits.

(3) Install new cup seals on all valve stems (long seal on intake valve and short seal on exhaust valve) and over valve guides (Figs. 17 and 18).—Install valve springs and retainers. Install springs so that the closed coils are against the cylinder head.

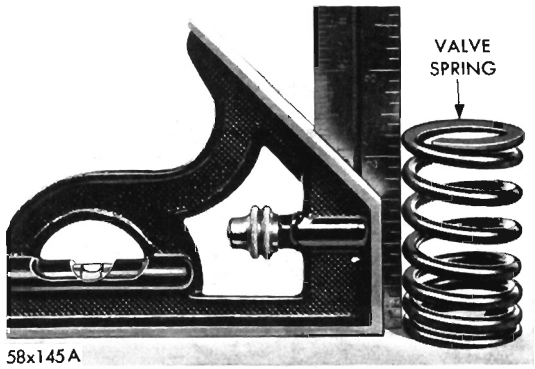


Fig. 16—Inspecting Valve Spring Squareness

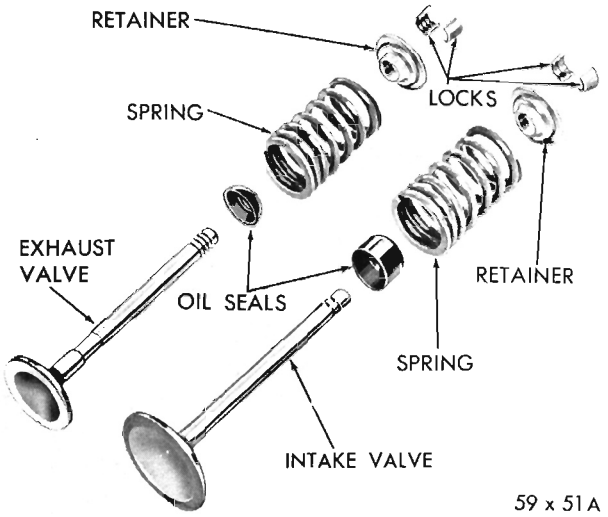


Fig. 17—Valve Assembly

(4) Compress the valve springs with Tool C-3422A, install locks and release tool. **If the valves and/or seats are reground, measure the installed height of springs. Make sure measurement is taken from the bottom of the springs seat in the cylinder head to the bottom surface of the spring retainer. (If spacers are installed, measure from the top of spacer). If the height is greater than 1 11/16 inches, install a 1/16 inch spacer in the head counterbore to bring the spring height back to normal 1 5/8 inches to 1 11/16 inches.**

8. TESTING VALVE TIMING

(1) Rotate the crankshaft until No. 6 exhaust valve is closing and No. 6 intake valve is opening. Install a dial indicator so that the indicator pointer contacts the valve spring retainer on No. 1 intake valve parallel to the axis of the valve stem.

(2) Turn No. 1 intake adjusting screw in one complete turn to remove the lash. Adjust the dial indicator to zero. Rotate the crankshaft clockwise (normal running direction) until the valve has lifted .019 inch. The timing of the crankshaft pulley should now read from 12 degrees before top dead center to dead center. Readjust the lash.

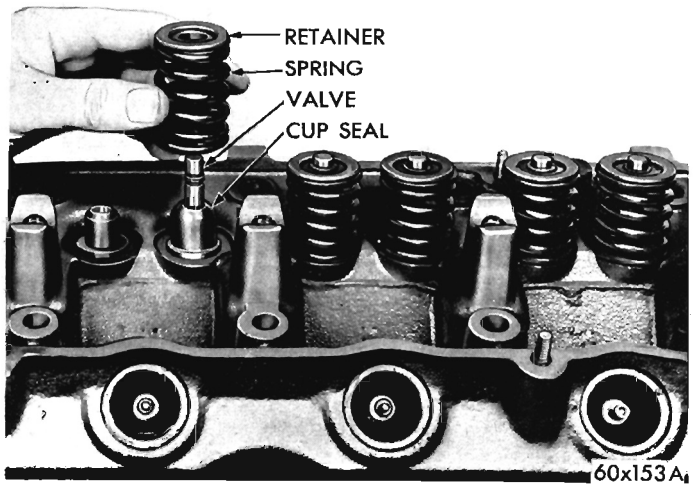


Fig. 18—Installing Valves and Cup Seals

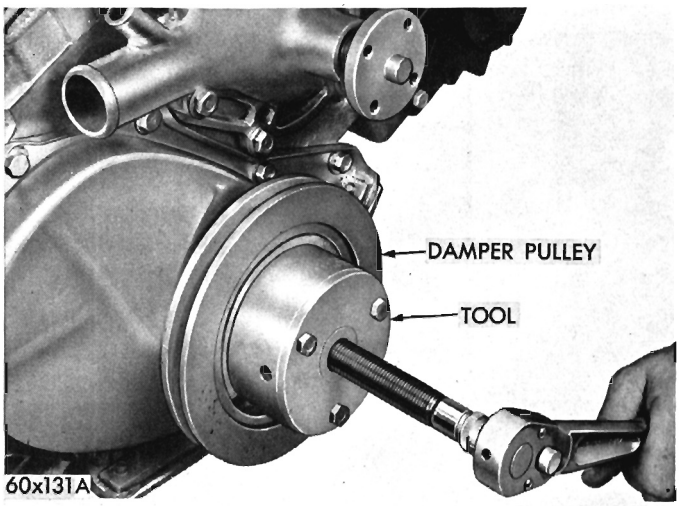


Fig. 19—Removing Puller Assembly (Tool C-3732A)

(3) If the reading is not within the specified limits:
- (a) Inspect the sprocket index marks.
- (b) Inspect the timing chain for wear.
- (c) Inspect the accuracy of the "DC" mark on the timing indicator.

9. TIMING SPROCKETS AND CHAIN

Removal

(1) Drain the cooling system.

(2) Remove the radiator and fan.

(3) Install Tool C-3732A and pull the vibration damper assembly off the end of the crankshaft (Fig. 19).

(4) Loosen oil pans bolts to allow clearance and remove the chain case cover and gasket.

(5) Slide the crankshaft oil slinger off the end of the crankshaft.
bolt.

(6) Remove the crankshaft sprocket attaching bolt.

(7) Remove the timing chain with the camshaft sprocket.

Installation

(1) Turn the crankshaft to line up the centerline of the camshaft and crankshaft with the timing mark on the crankshaft sprocket.

(2) Install the camshaft sprocket and the timing chain.

(3) Line up the timing marks on the sprockets with the centerline of the crankshaft and camshaft (Fig. 20).

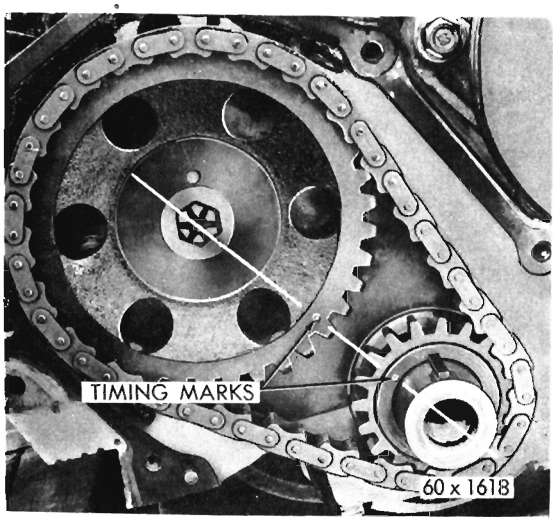


Fig. 20—Alignment of Timing Marks

(4) Tighten the camshaft sprocket lock bolt to 35 foot-pounds torque.

Checking Timing Chain for Stretch

(1) Place a scale next to the timing chain so that any movement of the chain may be measured.

(2) Place a torque wrench and socket over the camshaft sprocket lock bolt and apply torque in the direction of the crankshaft rotation to take up the slack; 30 foot-pounds (cylinder head installed) or 15 foot-pounds (cylinder head removed). **With a torque applied to the camshaft sprocket bolt, the crankshaft should not be permitted to move. It may be necessary to block the crankshaft to prevent rotation.**

(3) Holding a scale with dimensional reading even with the edge of a chain link, apply torque in the reverse direction 30 foot-pounds (cylinder head installed) or 15 foot-pounds (cylinder head removed) and note the amount of chain movement (Fig. 21).

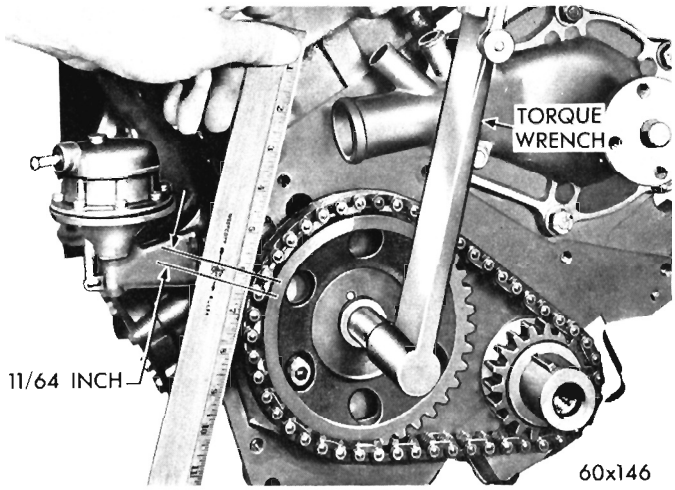


Fig. 21—Measuring Chain Stretch

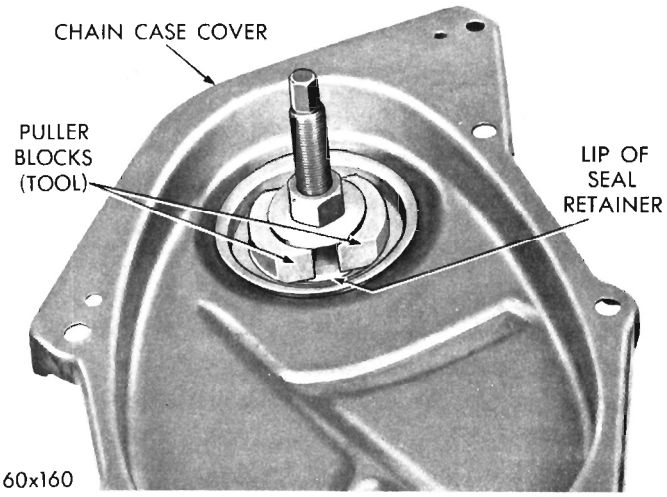


Fig. 22—Puller Blocks Expanded to Puller Position (Tool C-3506)

(4) If the chain movement exceeds $1\frac{1}{64}$ inch, install a new timing chain.

(5) If the chain is satisfactory, slide the crankshaft oil slinger over the shaft and up against the sprocket (flange away from sprocket).

10. TIMING CHAIN CASE COVER OIL SEAL REPLACEMENT

Removal

It is normal to find particles of neoprene collected between the seal retainer and crankshaft oil slinger after the seal has been in operation.

(1) Position puller screw of Tool C-3506 through case cover, the inside of case cover up. Position the puller locks directly opposite each other, and force the angular lip between the neoprene and flange of the seal retainer.

(2) Place the washer and nut on the puller screw.

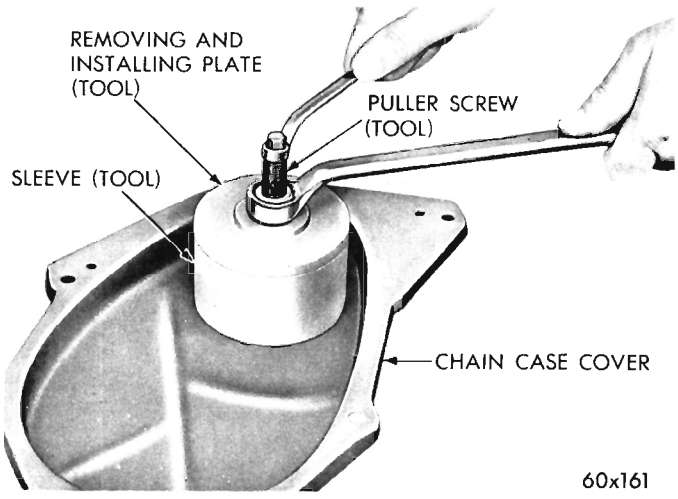


Fig. 23—Removing Oil Seal (Tool C-3506)

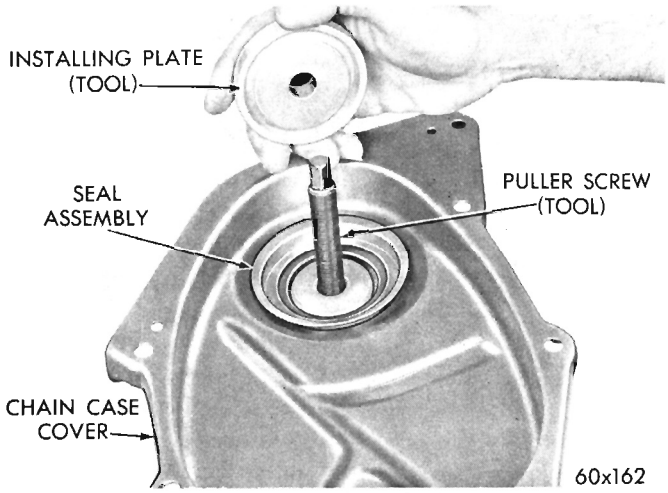


Fig. 24—Positioning Installer Plate (Tool C-3506)

Tighten the nut forcing blocks into gap to a point of distorting the seal retainer lip (Fig. 22). **Puller is only positioned at this point.**

(3) Place sleeve over the retainer and place removing and installing plate into sleeve.

(4) Place the flat washer and nut on the puller screw. Hold the center screw and tighten lock nut to remove seal (Fig. 23).

Installation of Oil Seal

(1) Insert the puller screw through the removing and installing plate so that the thin shoulder will be facing up.

(2) Insert the puller screw with the plate through the seal opening (inside of chain case cover facing up).

(3) Place the seal in the cover opening, with the neoprene down. Place the seal installing plate into the new seal, with the protective recess toward lip of the seal retainer (Fig. 24).

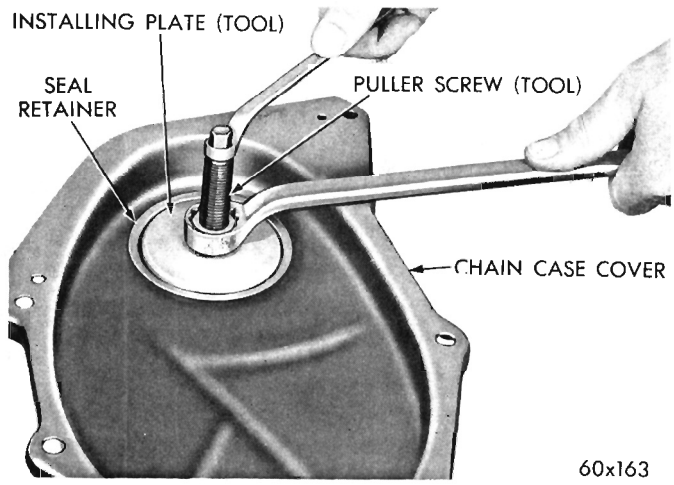


Fig. 25—Instaling New Seal (Tool C-3506)

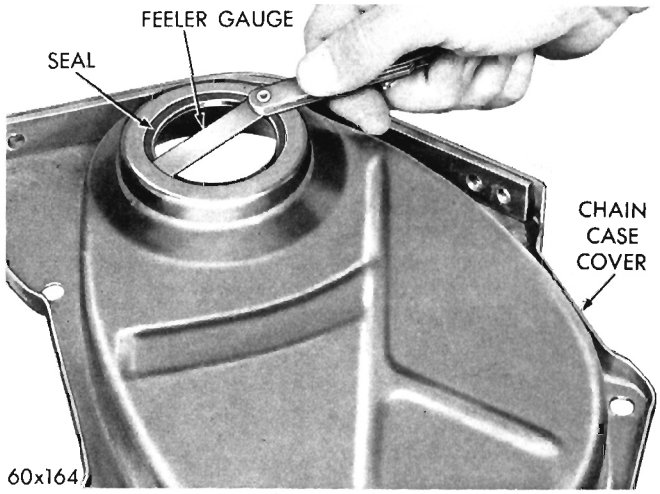


Fig. 26—Measuring Seal for Proper Seating

(4) Install the flat washer and nut on the puller screw; hold screw and tighten nut (Fig. 25).

(5) The seal is properly installed when the neoprene is tight against the face of the cover. Try to insert a .0015 inch feeler gauge between the neoprene and the cover (Fig. 26) if the seal is installed properly, the feeler gauge cannot be inserted.

Installing Chain Case Cover

(1) Be sure the mating surfaces of the chain case cover and cylinder block are clean and free from burrs.

(2) Using a new gasket, slide the chain case cover over the locating dowels and tighten the bolts to 15 foot-pounds. Be sure all the oil pan gaskets are in place and tighten the oil pan bolts to 200 inch-pounds.

Installing a Vibration Damper and Pulley Assembly

(1) Place the damper pulley assembly hub key in

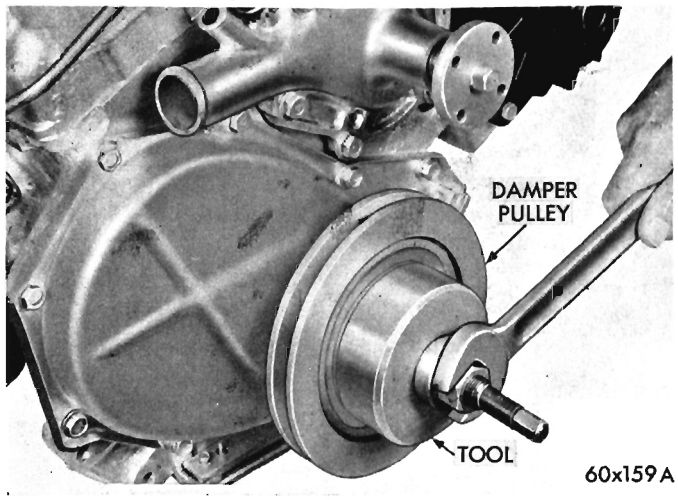


Fig. 27—Installing Damper

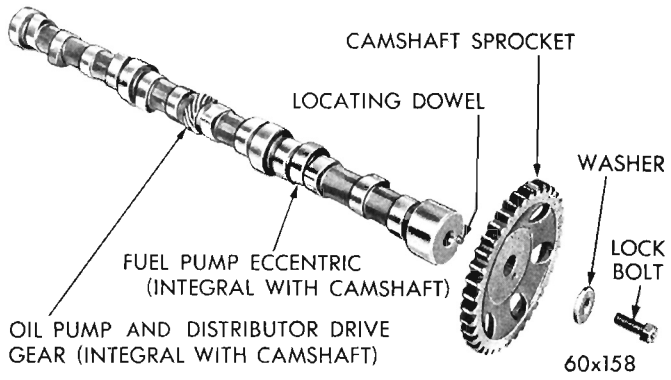


Fig. 28—Camshaft and Sprocket Assembly

the slot in the crankshaft, and slide the hub on the crankshaft.

(2) Place the installing tool, part of puller set Tool C-3732 in position and press the damper pulley assembly on the crankshaft (Fig. 27).

11. CAMSHAFT

The camshaft has an integral oil pump and distributor drive gear and fuel pump eccentric, as shown in Figure 28.

Rearward camshaft thrust is taken by the rear face of the cast iron camshaft sprocket hub, bearing directly on the front of the cylinder block, eliminating the need for a thrust plate.

The helical oil pump distributor drive gear and the camshaft lobe taper both tend to produce only a rearward thrust.

Removal

(1) Remove the tappets, using Tool C-3661.

(2) Remove the timing sprockets, distributor and the oil pump.

(3) Remove the fuel pump.

(4) Remove the camshaft, being careful not to damage the cam bearing with the cam lobes.

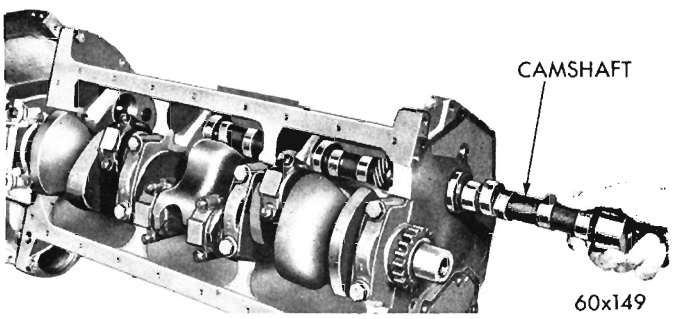


Fig. 29—Installing Camshaft

Installation

(1) Lubricate the camshaft lobes and camshaft bearing journals and insert the camshaft in the cylinder block (Fig. 29).

NOTE: Whenever an engine is rebuilt and a new camshaft and/or new tappets are installed, one quart of MoPar Engine Supplement, part Number 1879406 should be added to the engine oil to aid in break-in. The oil mixture should be left in the engine for a minimum of 500 miles. Drain the oil mixture at the next normal oil change.

NOTE: When replacing the camshaft, all of the tappet faces must be inspected for crown with a straight edge. If any negative crown (dish) is observed, the tappet must be replaced. The tappet must have a definite crown.

Installation of Distributor

Before installing the distributor, time the engine as follows:

NOTE: The distributor rotates clockwise.

(1) Rotate the crankshaft until the mark on the inner edge of the crankshaft pulley is in line with the "O" (TDC) mark on the timing chain case cover. No. 1 cyl. compression stroke).

(2) With distributor "O" rings in position, hold the distributor over the mounting pad.

(3) Turn the rotor to point forward, corresponding to 4 o'clock.

(4) Install the distributor so that with the distributor fully seated on the engine, the gear has spiraled to bring the rotor to a 5 o'clock position.

(5) Turn the housing until the ignition points are separating and rotor is under No. 1 cap tower.

(6) Install hold down bolt and connect the primary wire.

(7) Adjust the timing to specification, using a timing light, and connect the vacuum line.

12. CAMSHAFT BEARINGS (Engine Removed from Vehicle)

Removal

(1) With the camshaft removed, drive out the rear cam bearing welch plug.

(2) Install the proper size adapters and horse shoe washers (part of Tool C-3132A) at the back of each bearing shell and drive out all the bearing shells.

Installation

(1) Install the new camshaft bearings with Tool

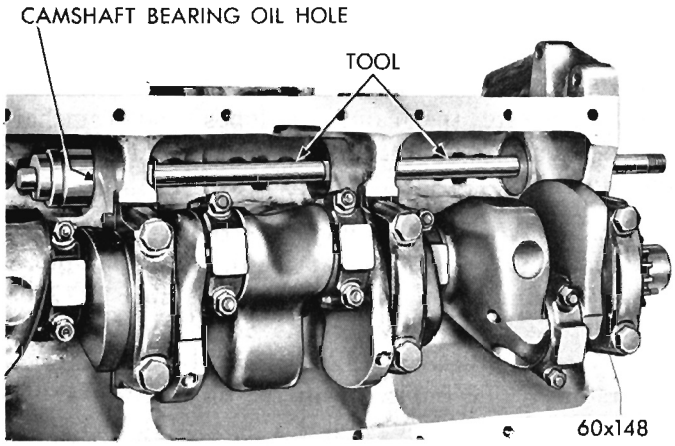


Fig. 30—Removing Camshaft Bearings (Tool C-3132A)

C-3132A by sliding the new camshaft bearing shell over the proper adapter.

(2) Position the bearing in the tool. Install the horseshoe lock and drive the bearing shell into place (Fig. 30). **The camshaft bearing oil hole must be in exact alignment with the drilled oil passage from the main bearing.**

(3) Install the remaining shells in like manner. **Install No. 1 camshaft bearing $^{3}/_{32}$ inch inward from the front face of the cylinder block.**

(4) Apply sealer to the plug and use Tool C-897 to install a new welch plug at the rear of the camshaft. **Be sure this plug does not leak.**

13. CYLINDER BLOCK

(1) Remove the top ridge of the cylinder bores using Tool C-3012 before removing pistons from the cylinder block. **Keep the tops of the pistons covered during this operation.**

(2) Pistons and connecting rods must be removed from the top of cylinder block. Rotate the crankshaft so that each connecting rod is centered in the cylinder bore.

(3) Remove the connecting rod cap.

(4) Install Tool C-3221 on one connecting rod bolt and protector over the other bolt. Push each piston and rod assembly out of cylinder bore.

Be careful not to nick the crankshaft journals.

(5) Install the bearing caps on the mating rods.

14. TESTING CYLINDERS

Inspection

The cylinder walls should be tested for out-of-round and taper with Tool C-119. If the cylinder bores show more than .005" out-of-round, or a taper of more than .010" or if the cylinder walls are badly scuffed or scored, the cylinder block should be rebored and honed, and new pistons and rings fitted. Whatever type of boring equipment is used, boring and honing operation should be closely coordinated with the fitting of pistons and rings in order that specified clearances may be maintained.

Honing Cylinder Bores

Before honing, stuff plenty of clean rags under the bores, over the crankshaft to keep the abrasive materials from entering the crankcase area.

(1) Used carefully, the cylinder bore resizing hone Tool C-823, equipped with 220 grit stones, is the best tool for this job. In addition to deglazing, it will reduce taper and out-of-round as well as removing light scuffing, scoring or scratches. Usually a few strokes will clean up a bore and maintain the required limits.

(2) Deglazing of the cylinder walls may be done using a cylinder surfacing hone, Tool C-3501, equipped with 280 grit stones (C-3501-3801). If the cylinder bore is straight and round 20-60 strokes depending on the bore condition will be sufficient to provide a satisfactory surface. Inspect cylinder walls after each 20 strokes. Use honing oil C-3501-3880 or a light honing oil available from a major oil distributor. Do not use engine or transmission oil, mineral spirits or kerosene.

(3) Honing should be done by moving the hone up and down fast enough to get a cross-hatch pattern. When hone marks intercept at 60°, the cross hatch angle is most satisfactory for proper seating of the rings. (See Fig. 31).

(4) After honing, it is necessary that the block be cleaned again to remove all traces of abrasives.

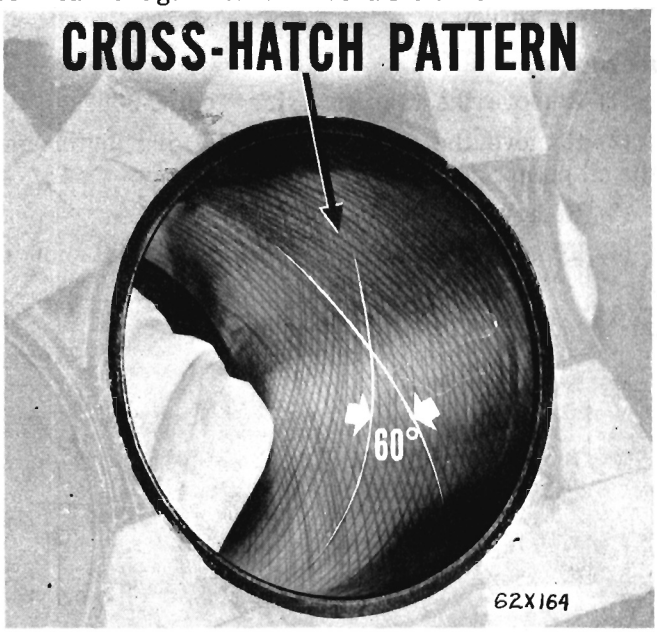


Fig. 31—Cross Hatch Pattern

CAUTION: Be sure all abrasives are removed from engine parts after honing. It is recommended that a solution of soap and water be used with a brush and the parts then thoroughly dried. The bore can be considered clean when it can be wiped clean with a white cloth and cloth remains clean. Oil bores after cleaning to prevent rusting.

15. PISTONS

The pistons are cam ground so that the diameter at the pin boss is less than its diameter across the thrust face. This allows for expansion under normal operating conditions. The expansion forces the pin bosses away from each other, and the piston assumes a more round shape. Inspect pistons for taper and elliptical shape before they are fitted into the cylinder bores. (See Fig. 32).

Finished Pistons

All pistons are machined to the same weight in grams, regardless of oversize to maintain piston balance. For cylinder bores which have been honed or rebored, all service pistons include pins and are available in standard and the following oversizes: .005, .020, .040 inch.

Fitting Pistons

The piston and cylinder wall must be clean and dry. The specified clearance between the piston and the cylinder wall is .0005 to .0015 inch.

(1) Pistons and cylinder bores should be measured at normal room temperature, 70 degrees F.

(2) Measure the piston diameter at the top of the skirt 90 degrees to the piston pin axis.

(3) Measure the cylinder bores halfway down the cylinder bore and transverse to the engine crankshaft center line.

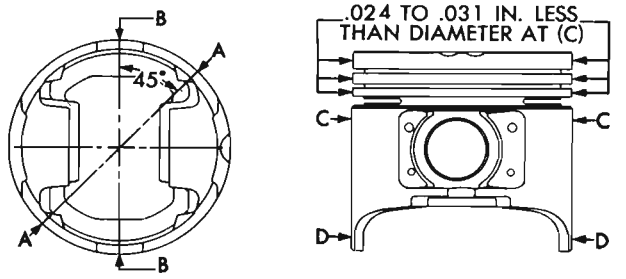


Fig. 32—Piston Measurements

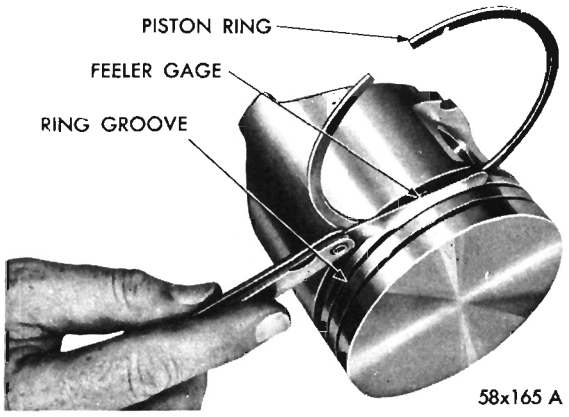


Fig. 33—Measuring Piston Ring Clearance

Fitting Rings

(1) Measure the piston ring gap about two inches from the bottom of the cylinder bore in which it is to be fitted. (An inverted piston can be used to push the rings down to insure positioning rings squarely in the cylinder wall).

(2) Insert the feeler stock in gap. The ring gap should be .010 to .047 inch for compression rings and .015 to .062 inch for the oil ring steel rails in standard size bores. Maximum gap in .005 inch o/s bores should be .060 inch for compression rings and .070 inch for oil ring steel rails.

(3) Measure the side clearance between the piston ring and ring land, as shown in Figure 33.

The clearance should be .0015 to .004 inch for the top compression ring and the intermediate ring, and .001 to .009 inch for the oil control ring.

(4) Starting with the oil ring expander, place expander ring in the lower ring groove and install the oil control ring using instructions in the package.

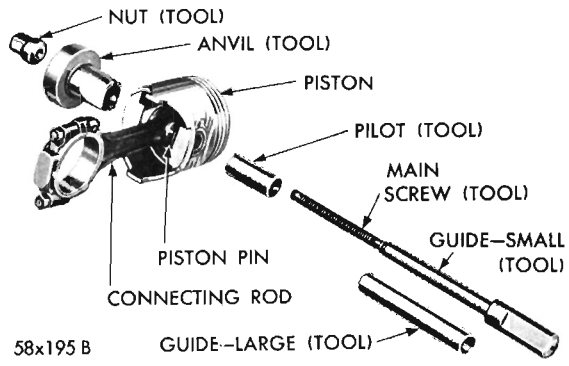


Fig. 34—Tool Arrangement for Removing Piston Pin (Tool C-3724)

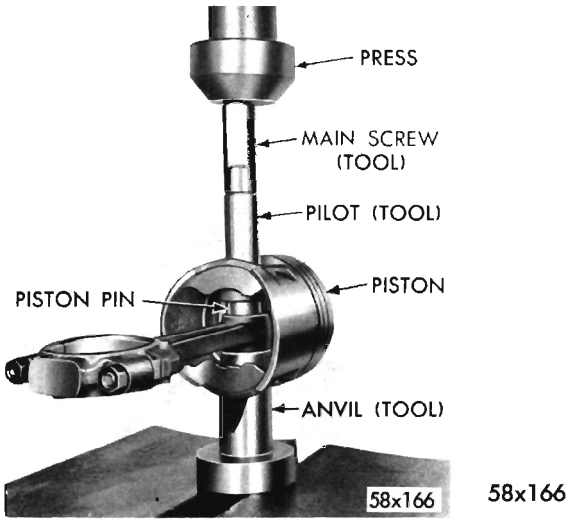


Fig. 35—Removing Piston Pin (Tool C-3724)

(5) Install the compression rings in the middle and top grooves. Using ring installer, Tool C-3805, be sure the mark "TOP" on each compression ring is to the top of piston.

16. PISTON PIN

Removal

(1) Arrange Tool C-3724 parts for the removal of the piston pin (Fig. 34).

(2) Install the pilot on the main screw.

(3) Install the screw through the piston pin.

(4) Install the anvil over the threaded end of the main screw with the small end of anvil against the piston boss. **Be sure spring is removed from anvil.**

(5) Install nut loosely on the main screw and place the assembly on the press (Fig. 35). Press the piston pin out of the connecting rod.

NOTE: When the pin falls free from the connecting rod, stop the press to prevent damage to the bottom of the anvil.

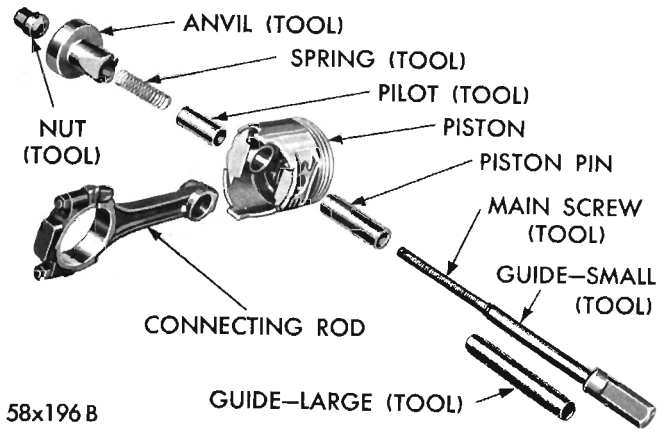


Fig. 36—Tool Arrangement for Installing Piston Pin (Tool C-3724)

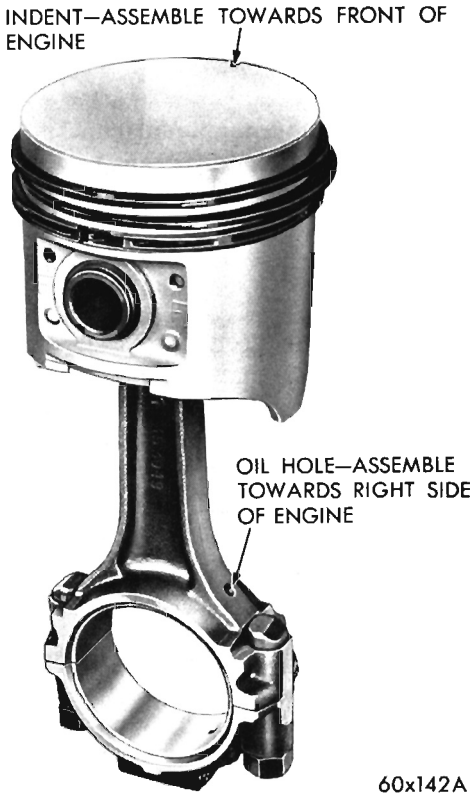


Fig. 37—Connecting Rod Oil Hole

(6) Remove the tool from the piston.

Installation

(1) Measure the piston pin fit in the piston. It should be a sliding fit in the piston at 70 degrees F. Piston pins are supplied in standard sizes only.

(2) Lubricate the piston pin holes in the piston and connecting rod.

(3) Arrange the tool parts for installation of the piston pin (Fig. 36).

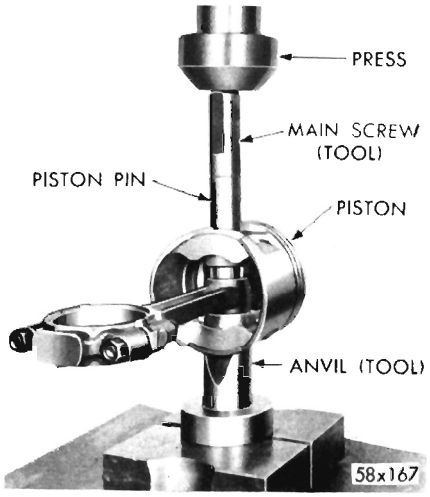


Fig. 38—Installing Piston Pin (Tool C-3724)

(4) Install the spring inside the pilot and install the spring and pilot in the anvil.

(5) Install the piston pin over the main screw.

(6) Place the piston, with "Notch Front" up, over the pilot so that the pilot extends through the piston pin holes.

(7) Position the connecting rod over the pilot which extends through the piston hole. **The oil hole in the connecting rod must point toward the direction, shown in Figure 37.**

(8) Install the main screw and piston pin in the piston (Fig. 38).

(9) Install the nut on the main screw to hold the assembly together. Place the assembly on a press (Fig. 38).

(10) Press in the piston pin until the piston pin bottoms on the pilot, properly positioning the pin in the connecting rod.

(11) Remove the tool and arrange the tool parts and piston assembly in the same manner, as shown in Figure 34 for measuring the pin fit.

(12) Place the assembly in a vise (Fig. 39).

(13) Attach the torque wrench to nut and test torque up to 15 foot-pounds. If the connecting rod moves downward on the piston pin, reject this connecting rod and piston pin combination. Install a new connecting rod and repeat the installation and testing procedure.

If the connecting rod does not move under 15 foot-pounds torque, the piston and connecting rod interference is satisfactory.

(14) Remove the tool.

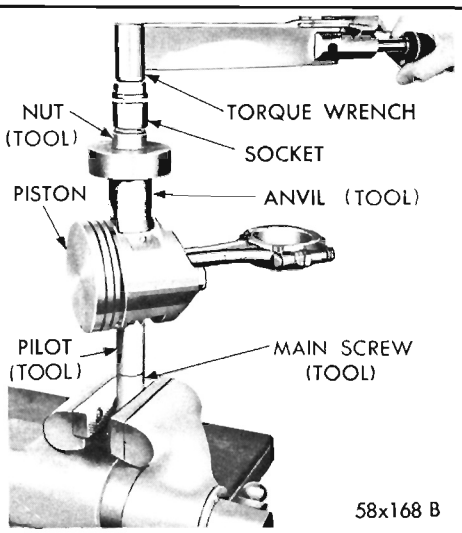


Fig. 39—Testing Fit of Piston Pin in Connecting Rod (Tool C-3724)

17. CONNECTING RODS

Installing Connecting Rod Bearings

(1) Install the connecting rod bearings so that the small formed tang fits into the machined groove in the connecting rod.

(2) The limits of taper or out-of-round on any crankshaft journal should be held to .001 inch. Bearings are available in standard .001, .002, .003, .010 and .012 inch undersize.

(3) Install the bearings in pairs. **Do not use a new bearing with an old bearing. Do not file the rods or the bearing caps.**

18. MEASURING THE CONNECTING ROD BEARING CLEARANCE

Shim Stock Method

(1) Place an oiled .001 inch feeler stock (½ inch wide and ¾ inch long) between the bearing and the connecting rod journal.

(2) Install the bearing cap and tighten to 45 foot-pounds torque.

(3) Turn connecting rod ¼ turn in each direction. A slight drag should be felt which indicates clearance is satisfactory. The correct clearance is from .0005 to .0015 inch.

(4) The side play should be from .006 to .012 inch.

Installing Piston and Connecting Rod Assembly in Cylinder Block

(1) Compression ring gaps should be located on the left side of the engine and staggered about 60° apart. Neither gap should line up with the oil ring rail gaps.

(2) Rotate oil ring expander so that the ends are at the right side of the engine. Rotate steel rails so that the gaps are approximately opposite and positioned above the piston pin holes.

(3) Immerse the piston head and rings in clean engine oil. Slide the ring compressor, Tool C-385, over the piston and tighten with special wrench (part of Tool C-385). **Position of rings must not change during this operation.**

(4) The notch on the top of the piston must point toward the front of the engine so that squirt hole in the connecting rod is toward the right side of the engine.

(5) Screw the connecting rod bolt protector (part of Tool C-3221) on one rod bolt, and insert the rod and piston into the cylinder bore. **Rotate the crankshaft so that the connecting rod journal is on the center of the cylinder bore.**

(6) Attach the puller part of Tool C-3221 on the other bolt, and guide the rod over the crankshaft

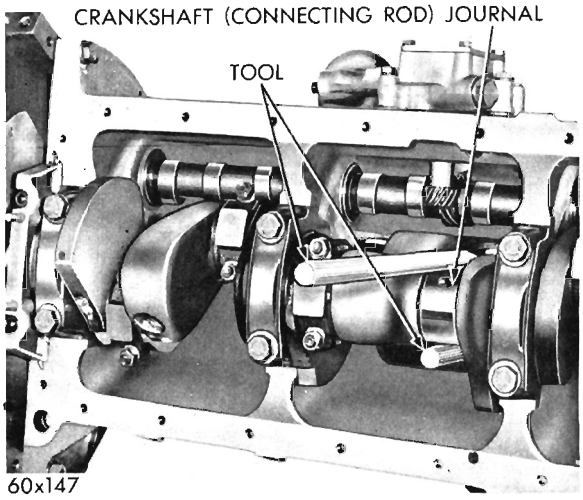


Fig. 40—Removing and Installing Connecting Rod (Tool C-3221)

journal (Fig. 40). Be careful not to nick the connecting rod journals.

(7) Tap the piston down in the cylinder bore, using the handle of a hammer. At the same time, guide the connecting rod into position on the crankshaft journal.

(8) Install the rod caps, tighten nuts to 45 foot-pounds torque.

19. CRANKSHAFT MAIN JOURNALS

The crankshaft journals should be inspected for excessive wear, taper and scoring. Journal grinding should not exceed .012 inch under the standard journal diameter. Do not grind the thrust faces of No. 3 main bearing. Do not nick the connecting rod or main bearing journal fillets. After regrinding, remove the rough edges from the crankshaft oil holes and clean out all oil passages.

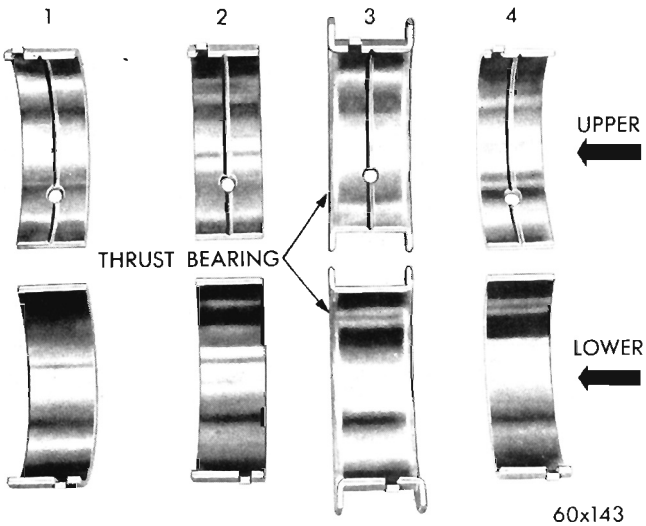


Fig. 41—Main Bearing Identification

20. CRANKSHAFT MAIN BEARINGS

The Nos. 1, 2 and 4 lower main bearings are interchangeable (Fig. 41). The Nos. 2 and 4 upper main bearings are interchangeable.

The No. 1 upper main bearing **is not interchangeable and is chamfered** on the tab side for timing chain oiling and can be identified by a red marking on the edge of the bearing. Upper main bearings are grooved and lower main bearings are plain and are not **interchangeable**. The No. 3 upper and lower main bearings are flanged to carry the crankshaft thrust loads are **are not interchangeable** with any other main bearings in the engine. **Bearings that are not badly worn, scored or pitted should be reinstalled in the same bearing bore.**

The bearing caps are not interchangeable and the numbers should be marked at removal to insure correct assembly. Bearings are available in standard and the following undersizes: .001, .002, .003, .010 and .012 inch. Never install an undersize bearing that will reduce the clearance below specifications.

Removal

(1) Remove the oil pan and inspect the bearing cap numbers.

(2) Remove bearing caps one at a time. Remove upper bearing by inserting Tool C-3059 (Fig. 42) into the oil hole on the crankshaft.

(3) Slowly rotate the crankshaft clockwise, forcing out the upper bearing.

21. MEASURING THE MAIN BEARING CLEARANCE

Shim Stock Method

(1) Position the crankshaft in block.

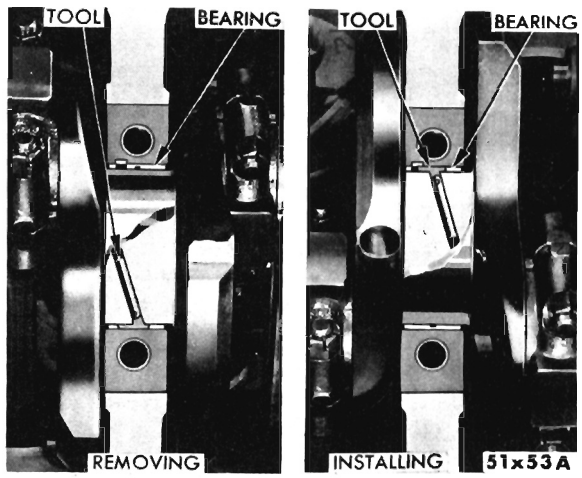


Fig. 42—Removing and Installing Upper Main Bearing (Tool C-3059)

(2) Smooth the edges of a ½x1 inch piece of soft copper or brass shim stock, .001 inch thickness.

(3) Lubricate the main bearing journals and position the shim stock across the center main journals.

(4) Install the bearing in the center main bearing cap, bearing tang in groove on cap, lubricate bearing and seat cap on block. Tighten bolts to 85 foot-pounds torque.

(5) If a slight drag is felt as the crankshaft is rotated, not over ¼ turn in either direction the clearance is .001 inch or less and is considered satisfactory.

If however, no drag is felt, the bearing is too large or the crankshaft cannot be rotated, the bearing is too small and should be replaced with the correct size.

It is permissible to use one .001 inch undersize bearing shell with one standard bearing shell, or one .002 inch undersize bearing shell with one .001 inch undersize shell. Always use the smaller diameter bearing half as the upper. Do not use a new bearing with a used bearing and never use an upper bearing half more than .001 inch smaller than the lower bearing half.

(6) Fit the remaining bearings in the same manner.

(7) Measure the crankshaft end play to .002-.007 inch. If end play is more than .007 inch, install a new center bearing.

22. REPLACEMENT OF THE REAR MAIN BEARING OIL SEAL— Crankshaft Removed

Cylinder Block

(1) Install a new oil seal in the cylinder block so that both ends protrude.

(2) Tap seal down into position, using Tool C-3743 (with bridge removed) until the tool is seated in the bearing bore.

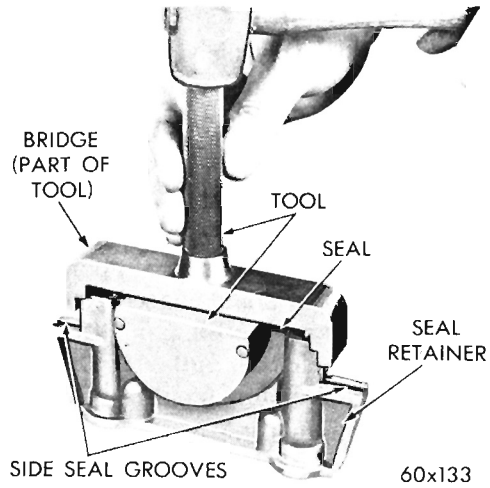


Fig. 43—Installing Rear Main Bearing Oil Seal (Tool C-3743)

(3) Hold tool in this position and cut off the portion of the seal that extends above the block on both sides.

Bearing Cap

(1) Install a new seal in the seal retainer so that the ends protrude (Fig. 43).

(2) Install the bridge on the tool and tap the seal down into position until the tool is seated.

(3) Trim off the portion of the seal that protrudes above the cap (Fig. 44).

(4) Install the two side seals in the grooves in the seal retainer.

(5) When installing the seal retainer, tighten screws to 30 foot-pounds torque.

ENGINE OILING SYSTEM

23. OIL PAN (Fig. 45)

Removal 170 or 225 Cubic Inch Engine (Valiant)

(1) Raise the vehicle on hoist. Drain the oil pan.

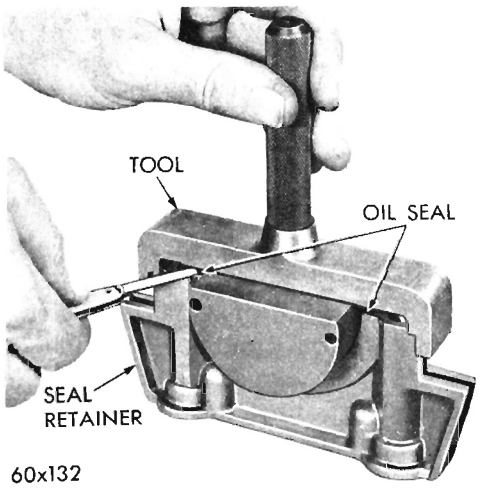


Fig. 44—Trimming Rear Main Bearing Oil Seal (Tool C-3743)

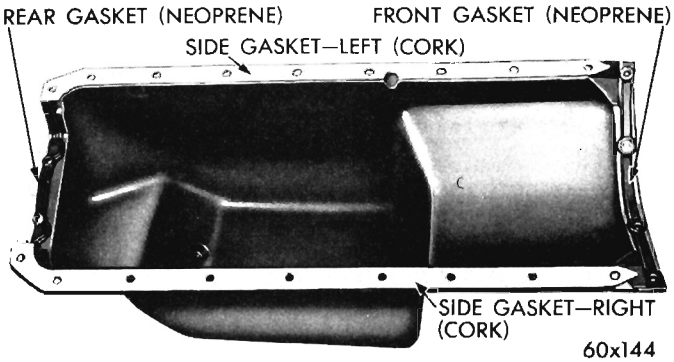


Fig. 45—Oil Pan and Gaskets

(2) Using tie rod end puller, Tool C-3742, remove the steering and idler arm ball joints from the steering linkage center link. Remove the dust shield and the motor mount stud nuts.

(3) Lower the vehicle and remove the horns and mounting brackets, then disconnect the negative ground cable from the battery.

(4) Install the engine lifter plate Tool C-3804 and fixture C-3809. Raise the engine from 1½ to 2 inches.

(5) Again raise the vehicle on the hoist, then remove the oil pan.

225 Cubic Inch Engine (Plymouth)

(1) Raise the vehicle on a hoist. Drain oil pan.

(2) Using tie rod end puller, Tool C-3742, remove the steering and idler arm ball joints from the steering linkage center link. Remove the dust shield.

(3) Remove the oil pan attaching bolts, rotate the engine crankshaft to clear the counterweights, then remove the oil pan.

Cleaning and Inspection

Clean the oil pan in solvent and wipe dry with a clean cloth. Scrape all gasket material from the mounting surface of the pan and crankcase, as shown in Figure 45.

Inspect the oil drain plug and plug hole for stripped or damaged threads and repair as necessary. Install a new drain plug gasket.

Inspect the oil pan mounting flange for bends or distortion. Straighten the flange if necessary.

Clean the oil screen and pipe thoroughly in clean solvent. Inspect the condition of the screen.

Install the oil screen and pipe. Turn in pipe until it begins to tighten in the crankcase, continue tightening until screen is positioned, as shown in Figure 46. Hold a steel rule against the flat surface inside the case and measure from the edge of rule to the edge of the oil screen. The measurement should be 1⅛ inches with the screen properly positioned.

The screen must be an interference with the bottom of the oil pan.

Installation
170 or 225 Cubic Inch Engine (Valiant)

(1) Using a new pan gasket, install the oil pan and tighten bolts to 200 inch-pounds.

(2) Connect the steering and idler arm ball joints to the center link. Tighten the retaining nuts to 40 foot-pounds torque, and secure with cotter pins. Install the dust shield.

(3) Lower the vehicle on the hoist, then lower the engine down into position. Remove the lifting fixture and plate.



Fig. 46—Positioning Oil Pickup Tube and Screen

(4) Install the horns and mounting brackets, and install the air cleaner.

(5) Again raise the vehicle on the hoist and install the motor mount stud nuts. Tighten to 85 foot pounds torque.

(6) Lower the vehicle and fill with the proper grade and quantity of motor oil.

225 Cubic Inch Engine (Plymouth)

(1) Using a new oil pan gasket set, install the oil pan and tighten bolts to 200 inch pounds torque.

(2) Connect the steering and idler arm ball joints to the center link. Tighten the retaining nuts to 40 foot pounds torque and secure with cotter pins. Install the dust shield.

(3) Lower the vehicle and fill with the proper grade and quantity of motor oil.

24. OIL PUMP

Removal

(1) Drain the radiator, disconnect the upper and lower hoses.

(2) Disconnect the fuel line at the fuel pump inlet.

(3) Disconnect the throttle linkage at the carburetor and lay it over the engine.

(4) With the vehicle on a hoist, support the front of the engine with a jack stand placed under the right front corner of the engine oil pan. **(Do not support the engine at the crankshaft pulley or vibration damper.)** Remove the front engine mounts.

(5) Cut a piece of wooden 2x4, eight inches long.

(6) Raise the front of the engine just high enough to insert the piece of 2x4 between the front rail of the "K" member and the right front lower portion

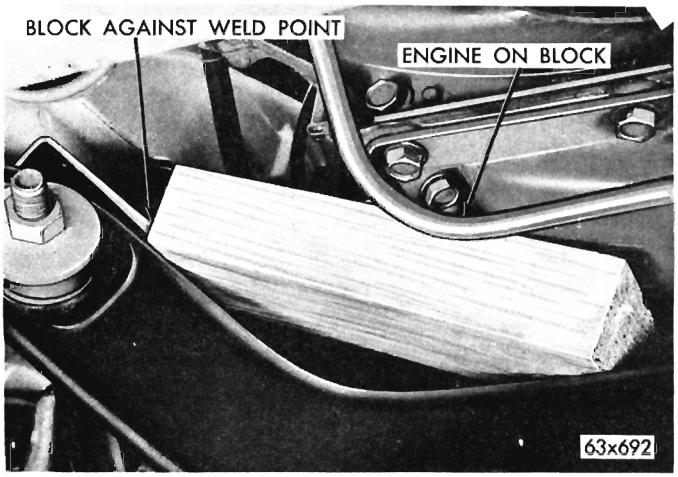


Fig. 47—Positioning Block

of the engine oil pan. Position the block, as shown in Figure 47 so one end is against the edge of the right front engine mount support where it is welded to the "K" member.

(7) Lower the front of the engine so it rests on the 2x4 block near the right front corner of the oil pan.

(8) Exert a light pressure, with a pry bar, against the right side of the engine, as shown in Figure 48.

(9) This will cause the 2x4 block and the front of the engine to slide to the left approximately 1½ inches, as shown in Figure 49.

(10) This movement will also cause the engine to tip slightly toward the left.

(11) Remove the engine oil filter, and remove the oil pump cover and outer rotor.

CAUTION: The outer rotor will drop out when the pump cover is removed. Do not allow the rotor to be damaged by falling.

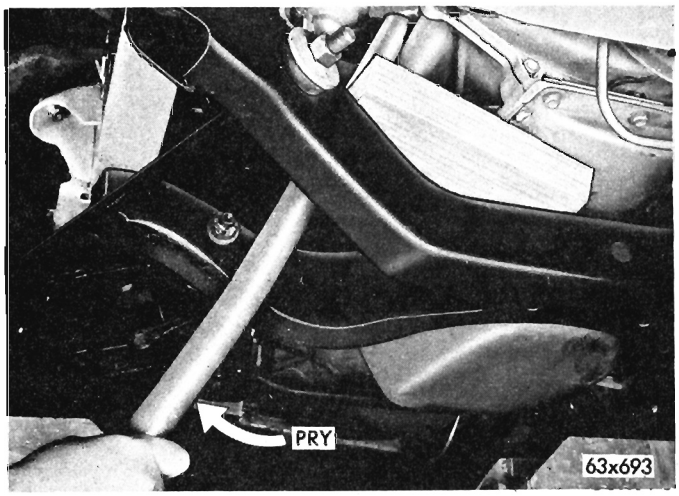


Fig. 48—Moving Engine

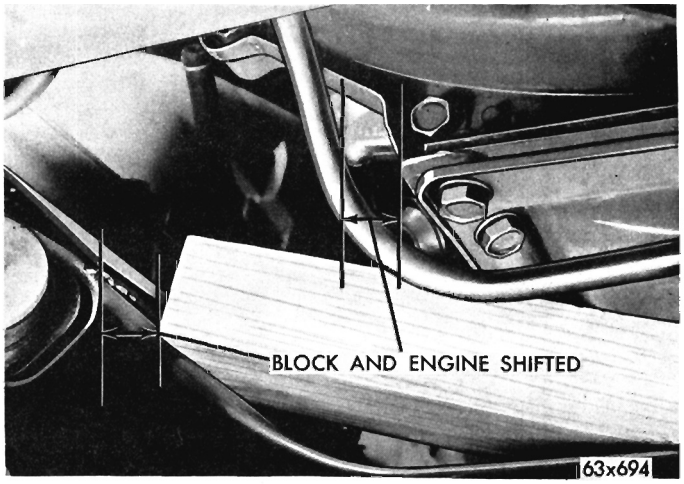


Fig. 49—Engine Relocated

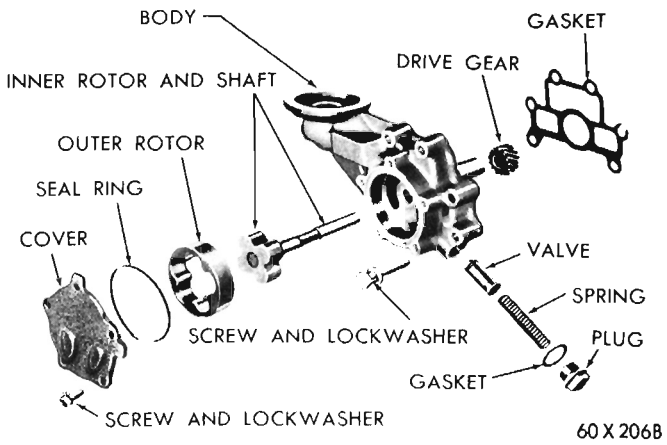


Fig. 50—Oil Pump (Disassembled View)

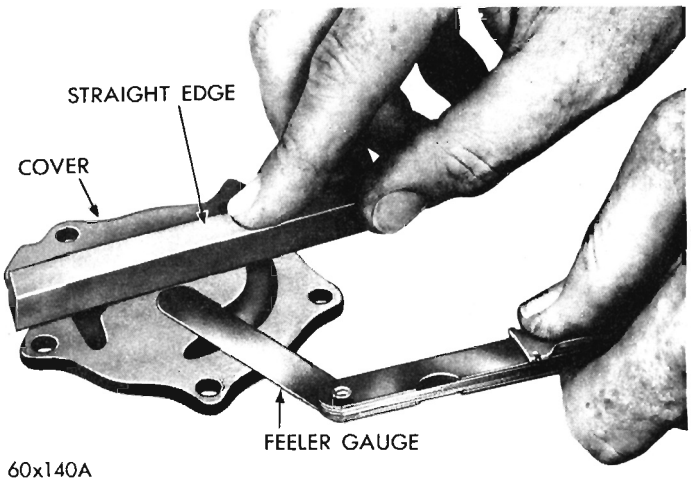


Fig. 51—Measuring Oil Pump Cover Flatness

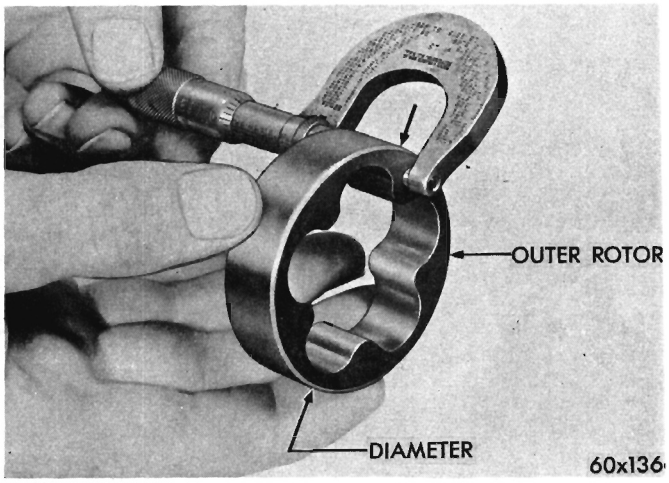


Fig. 52—Measuring Outer Rotor Thickness

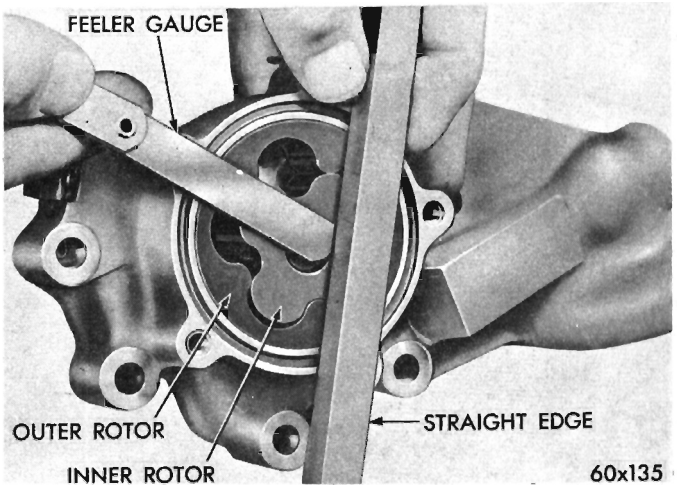


Fig. 54—Measuring Clearance Over Rotors

(12) If the above instructions have been followed closely, just enough clearance will be provided between the engine and the "K" member to allow removal of the oil pump.

Disassembly (Fig. 50)

(1) Remove the pump cover and seal ring.

(2) Press off the drive gear. Support the gear to keep the load off of the aluminum body.

(3) Remove the pump rotor and shaft and lift out the outer pump rotor.

(4) Remove the oil pressure relief valve plug and lift out spring and plunger (Fig. 50).

Inspection and Repair

(1) Clean all parts thoroughly. The mating face of the oil pump cover should be smooth. Replace the cover if it is scratched or grooved.

(2) Lay a straightedge across the oil pump cover surface (Fig. 51). If a .0015 inch feeler gauge can be inserted between the cover and straightedge, the cover should be replaced.

(3) If the outer rotor length measures less than .649 inch (Fig. 52), and the diameter less than 2.469 inches, replace the outer rotor.

(4) If the inner rotor length measures less than .649 inch (Fig. 53), replace the inner rotor.

(5) Slide the outer rotor and inner rotor into the pump body and place a straightedge across the face between the bolt holes (Fig. 54).

(6) If a feeler gauge of more than .004 inch can be inserted between the rotors and straightedge, replace the pump body.

(7) Remove the inner rotor and shaft leaving the outer rotor in the pump cavity.

(8) Press the outer rotor body to one side with the fingers and measure the clearance between the outer rotor and the pump body (Fig. 55). If the measurement is more than .012 inch, replace the oil pump body.

(9) If the clearance between the inner rotor and outer rotor (Fig. 56) is more than .010 inch, replace the inner and outer rotors.

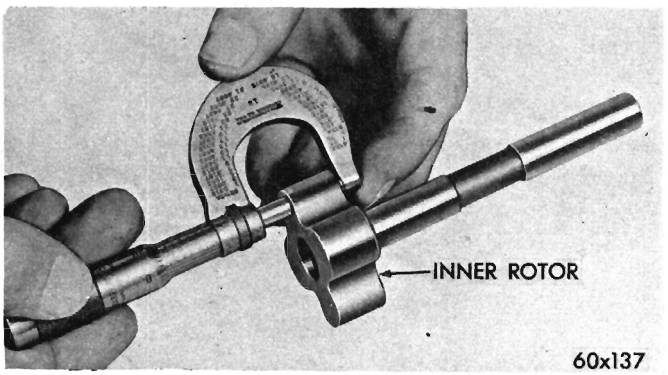


Fig. 53—Measuring Inner Rotor Thickness

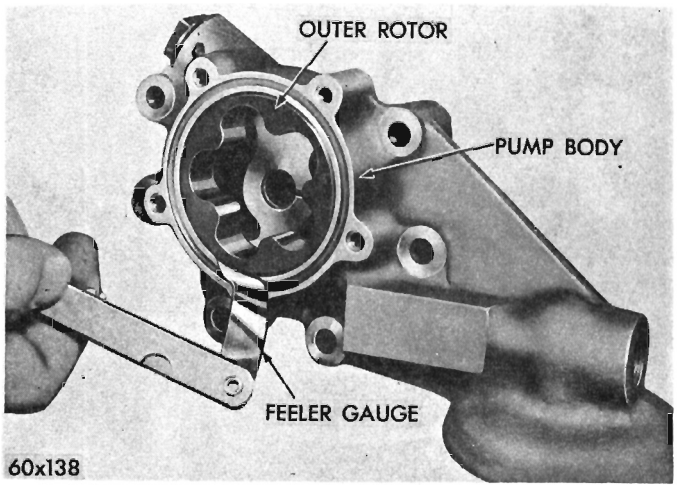


Fig. 55—Measuring Outer Rotor Clearance

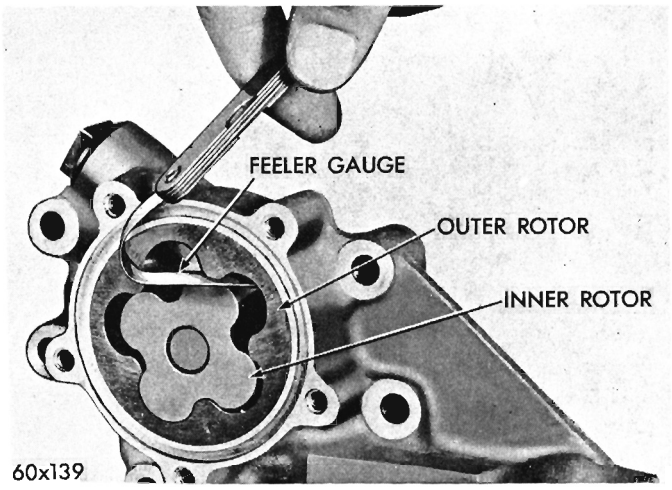


Fig. 56—Measuring Clearance Between Rotors

(10) Inspect the oil pump relief valve plunger for scoring and for free operation in its bore. Small scores may be removed with 400 grit wet or dry paper providing extreme care is used not to round off the sharp edge portion of the valve.

(11) For 170-225 cubic inch engines the relief valve has a free length of 2 9/32 to 2 19/64 inch and is red in color.

(12) If the oil pressure is low, inspect for worn bearings, or look for other causes of possible loss of oil pressure.

Assembly

(1) Assemble the pump, using new parts as required.

(2) Install new oil seal rings between the cover and the body. Tighten the cover bolts to 130 inch-pounds torque.

Installation

(1) Install the oil pump, without the outer rotor and cover, using a new gasket.

(2) Install the outer rotor, seal, pump cover and oil filter.

(3) Center the engine to its original position. Using a jack stand to support the front end of the engine, and install the front engine mounts.

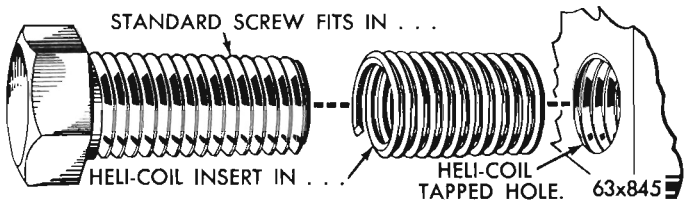


Fig. 57—Heli-Coil Installation

(4) Connect the fuel line, throttle linkage, upper and lower radiator hoses.

(5) Refill the radiator.

25. OIL FILTER

The oil filter should be replaced every 6 months to coincide with an engine oil change.

(1) Using Tool C-3845, unscrew the filter from base of oil pump and discard.

(2) Wipe the base clean.

(3) Screw the new filter on the base until the gasket on the filter contacts the base.

(4) To obtain an effective seal, tighten filter **by hand** the additional number of turns **indicated on the replacement filter.** Start engine and inspect for leaks.

26. REPAIR OF DAMAGED OR WORN THREADS

Damaged or worn threads can be repaired by the use of Heli-Coils. Essentially, this repair consists of drilling out the worn or damaged threads, tapping the hole with a special Heli-Coil Tap, and installing a Heli-Coil Insert into the tapped holes. This brings the hole back to its original thread size. (See Fig. 57.)

The following chart lists the threaded hole sizes which are used in the engine block and the necessary tools and inserts for the repair of damaged or worn thread. Heli-Coil tools and inserts are readily available from automotive parts jobbers.

HELI-COIL INSERT			DRILL	TAP	INSERTING TOOL	EXTRACTING TOOL
Thread Size	Part No.	Insert Length	Size	Part No.	Part No.	Part No.
1/2-20	1185-4	3/8"	17/64 (.266)	4 CPB	528-4N	1227-6
5/16-18	1185-5	15/32"	Q (.332)	5 CPB	528-5N	1227-6
3/8-16	1185-6	9/16"	X (.332)	6 CPB	528-6N	1227-6
7/16-14	1185-7	21/32"	29/64 (.453)	7 CPB	528-7N	1227-16
1/2-13	1185-8	3/4"	33/64 (.516)	8 CPB	528-8N	1227-16

PART 2

SPECIFICATIONS

8-CYLINDER ENGINES

	V-800	Commando	Commando	Police	Commando
ENGINE	"318"	"361"	"383"	"413"	"426"
Type	90° V	90° V	90° V	90° V	90° V
Number of Cylinders	8	8	8	8	8
Bore	3.91″	4.125″	4.25″	4.19″	4.25″
Stroke	3.31″	3.375″	3.375″	3.750″	3.750″
Piston Displacement	318 cu. in.	361 cu. in.	383 cu. in.	413 cu. in.	426 cu. in.
Compression Ratio	9.0 to 1	9.0 to 1	10.0 to 1	10.0 to 1	10.5 to 1
Compression Pressure with engine warm spark plugs removed—wide open throttle	125-155 psi	130-165 psi	130-165 psi	130-165 psi	130-165 psi
Maximum variation between cylinders (any one engin)	20 psi	25 psi	25 psi	25 psi	25 psi
Firing Order	1-8-4-3-6-5-7-2	1-8-4-3-6-5-7-2	1-8-4-3-6-5-7-2	1-8-4-3-6-5-7-2	1-8-4-3-6-5-7-2
Basic Timing	10° B.T.D.C.	10° B.T.C.D.	10° B.T.D.C.	10° B.T.D.C.	10° B.T.D.C.
CYLINDER NUMBERING (front to rear)					
Left Bank	1-3-5-7	1-3-5-7	1-3-5-7	1-3-5-7	1-3-5-7
Right Bank	2-4-6-8	2-4-6-8	2-4-6-8	2-4-6-8	2-4-6-8
CYLINDER BLOCK					
Cylinder Bore (standard)	3.910″-3.912″	4.1245″-4.1265″	4.2495″-4.2515″	4.1870″-4.1890″	4.2495″-4.2515″
Cylinder Bore Out-of-Round (Max. allowable before reconditioning)	.005″	.005″	.005″	.005″	.005″
Cylinder Bore Taper (Max. allowable before reconditioning)	.010″	.010″	.010″	.010″	.010″
Reconditioning Working Limits (for taper and out-of-round)	.001″	.001″	.001″	.001″	.001″
Maximum Allowable Oversize (cylinder bores)	.040″	.040″	.040″	.040″	.040″
Tappet Bore Diameter	.9050″-.9058″	.9050″-.9058″	.9050″-.9058″	.9050″-.9058″	.9050″-.9058″
Distributor Lower Drive Shaft Bushing (press fit in block)	.0005″-.0040″	.0005″-.0040″	.0005″-.0040″	.0005″-.0040″	.0005″-.0040″
Ream to	.4865″-.4880″	.4865″-.4880″	.4865″-.4880″	.4865″-.4880″	.4865″-.4880″
Shaft to Bushing Clearance	.0007″-.0027″	.0007″-.0027″	.0007″-.0027″	.0007″-.0027″	.0007″-.0027″
PISTONS					
Type Material	Aluminum—Alloy Tin Coated	Autothermic W/Steel Struts	Autothermic W/Steel Struts	Autothermic W/Steel Struts	Autothermic W/Steel Struts
Clearance in Bore (with .0015 x ½″ feeler stock)	5-10 lbs. Pull	Method Not Used	Method Not Used	Method Not Used	Method Not Used
Land Clearance (diametral)	.029″-.034″	.032″-.038″	.032″-.038″	.032″-.040″	.032″-.038″
Clearance at Top of Skirt	.0005″-.0015″	.0003″-.0013″	.0003″-.0013″	.0003″-.0013″	.0003″-.0013″
Weight (Std. through .040″ oversize)	592 gms.	717 gms.	770 gms.	770 gms.	770 gms.
Piston Length (overall)	3.21″	3.81″	3.84″	3.84″	3.84″
Ring Groove Depth					
No. 1	.205″	.214″	.220″	.220″	.220″
No. 2	.205″	.214″	.220″	.220″	.220″
No. 3	.198″	.203″	.208″	.208″	.208″
Pistons for Service	Std., .005″, .020″, .040″ Oversize	Std., .005″, .020″, .040″ Oversize	Std., .005″, .020″, .040″ Oversize	Std., .005″, .020″, 040″ Oversize	Std., .005″, .020″, .040″ Oversize

SPECIFICATIONS—(Continued)

	"318"	"361"	"383"	"413"	"426"
PISTON PINS					
Type	Full Floating	Press Fit in Rod	Press Fit in Rod	Press Fit in Rod	Press Fit in Rod
Diameter	.9842″	1.0935″-1.0937″	1.0935″-1.0937″	1.0935″-1.0937″	1.0935″-1.0937″
Length	2.995″	3.555″-3.575″	3.555″-3.575″	3.555″-3.575″	3.555″-3.575″
Clearance in Piston (Light Thumb Push @ 70°F.)	.0000″-.0005″	.00045″-.00075″	.00045″-.00075″	.00045″-.00075″	.00045″-.00075″
End Play	.004″-.026″				
Clearance in Rod	.0000″-.0005″				
Interference in Rod		.0007″-.0012″	.0007″-.0012″	.0007″-.0012″	.0007″-.0012″
Pins for Service	Std., .003″, .008″ Oversize	Standard Only	Standard Only	Standard Only	Standard Only
PISTON RINGS					
Number of Rings per Piston	3	3	3	3	3
Compression	2	2	2	2	2
Oil with Expander	1	1	1	1	1
Piston Ring Gaps	.010″-.020″	.013″-.025″	.013″-.025″	.013″-.025″	.013″-.025″
Ring Side Clearance—Top	.0015″-.0030″	.0015″-.0030″	.0015″-.0030″	.0015″-.0030″	.0015″-.0030″
Intermediate	.0015″-.0030″	.0015″-.0030″	.0015″-.0030″	.0015″-.0030″	.0015″-.0030″
Oil (service ring)	.009″ Maximum	.009″ Maximum	.009″ Maximum	.009″ Maximum	.009″ Maximum
Width of Rings (Compression)	.0775″-.0780″	.077″-.078″	.077″-.078″	.077″-.078″	.077″-.078″
(Oil)	.1860″-.1865″	.1860″-.1865″	.1860″-.1865″	.1860″-.1865″	.1860″-.1865″
CONNECTING RODS					
Length (Center to Center)	6.123″	6.356″-6.360″	6.356″-6.360″	6.766″-6.770″	6.766″-6.770″
Weight (less bearing shells)	726 gms.	812 ± 4 gms.	812 ± 4 gms.	846 ± 4 gms.	846 ± 4 gms.
Side Clearance (two rods)	.006″-.014″	.009″-.017″	.009″-.017″	.009″-.017″	.009″-.017″
Piston Pin Bore Diameter	1.027″-1.039″	1.0925″-1.0829″	1.0925″-1.0928″	1.0925″-1.0928″	1.0925″-1.0928″
CONNECTING ROD BUSHING					
Type	Steel Backed Bronze	None	None	None	None
CONNECTING ROD BEARINGS (Type)	Steel Backed Grid Type	Steel Backed Babbitt	Steel Backed Babbitt	Steel Backed Babbitt	Steel Backed Babbitt
Diameter and Width	2.126″ x .842″	2.376″ x .927″	2.376″ x .927″	2.376″ x .927″	2.376″ x .927″
Clearance desired	.0005″-.0015″	.0005″-.0015″	.0005″-.0015″	.0005″-.0015″	.0005″-.0015″
Maximum Allowable	.0025″	.0025″	.0025″	.0025″	.0025″
Bearings for Service	Std., .001″, .002″, .003″, .010″, .012″	Std., .001″, .002″, .003″, .010″, .012″	Std., .001″, .002″, .003″, .010″, .012″	Std., .001″, .002″, .003″, .010″, .012″	Std., .001″, .002″, .003″, .010″, .012″
CRANKSHAFT					
Type	Fully Counter-Balanced	Fully Counter-Balanced	Fully Counter-Balanced	Fully Counter-Balanced	Fully Counter-Balanced
Bearings	Steel Backed Babbitt	Steel Backed Babbitt	Steel Backed Babbitt	Steel Backed Babbitt	Steel Backed Babbitt
Thrust Taken By	No. 3 Main Bearing	No. 3 Main Bearing	No. 3 Main Bearing	No. 3 Main Bearing	No. 3 Main Bearing
End Play	.002″-.007″	.002″-.007″	.002″-.007″	.002″-.007″	.002″-.007″
Maximum Allowable	.010″	.010″	.010″	.010″	.010″
Diametral Clearance Desired	.0005″-.0015″	.0005″-.0015″	.0005″-.0015″	.0005″-.0015″	.0005″-.0015″
Diametral Clearance Allowed	.0025″	.0025″	.0025″	.0025″	.0025″
Finish at Rear Oil Seal Surface	Diagonal Knurling	Diagonal Knurling	Diagonal Knurling	Diagonal Knurling	Diagonal Knurling

SPECIFICATIONS—(Continued)

		"318"	"361"		"383"		"413"	"426"
MAIN BEARING JOURNALS								
Diameter		2.4995"-2.5005"	2.6245"-2.6255"		2.6245"-2.6255"		2.7495"-2.7505"	2.7495"-2.7505"
Maximum Allowable Out-of-Round and/or Taper		.001"	.001"		.001"		.001"	.001"
Bearings for Service Available in Standard and the following undersizes.		.001", .002", .003", .010", .012"	.001", .002", .003", .010", .012"		.001", .002", .003", .010", .012"		.001", .002", .003", .010", .012"	.001", .002", .003", .010" .012"
CONNECTING ROD JOURNALS								
Diameter		2.124"-2.125"	2.375"-2.375"		2.374"-2.375"		2.374"-2.375"	2.374"-2.375"
Maximum Allowable Out-of-Round and/or Taper		.001"	.001"		.001"		.001"	.001"
CAMSHAFT								
Drive		Chain	Chain		Chain		Chain	Chain
Bearings		Steel Backed Babbitt	Steel Backed Babbitt		Steel Backed Babbitt		Steel Backed Babbitt	Steel Backed Babbitt
Number		5	5		5		5	5
Diametral Clearance		.001"-.003"	.001"-.003"		.001"-.003"		.001"-.003"	.001"-.003"
Maximum Allowable before Reconditioning		.005"	.005"		.005"		.005"	.005"
Thrust Taken By		Thrust Plate	Cylinder Block		Cylinder Block		Cylinder Block	Cylinder Block
End Play		.002"-.006"	—		—		—	—
Maximum Allowable		.010"	—		—		—	—
CAMSHAFT JOURNALS								
Diameter	No. 1	1.998"-1.999"	1.998"-1.999"		1.998"-1.999"		1.998"-1.999"	1.998"-1.999"
	No. 2	1.982"-1.983"	1.982"-1.983"		1.982"-1.983"		1.982"-1.983"	1.982"-1.983"
	No. 3	1.967"-1.968"	1.967"-1.968"		1.967"-1.968"		1.967"-1.968"	1.967"-1.968"
	No. 4	1.951"-1.952"	1.951"-1.952"		1.951"-1.952"		1.951"-1.952"	1.951"-1.952"
	No. 5	1.5605"-1.5615"	1.748"-1.749"		1.748"-1.749"		1.748"-1.749"	1.748"-1.749"
CAMSHAFT BEARINGS								
Diameter	No. 1	2.000"-2.001"	2.000"-2.001"		2.000"-2.001"		2.000"-2.001"	2.000"-2.001"
	No. 2	1.984"-1.985"	1.984"-1.984"		1.984"-1.984"		1.984"-1.984"	1.984"-1.984"
	No. 3	1.969"-1.970"	1.969"-1.970"		1.969"-1.970"		1.969"-1.970"	1.969"-1.970"
	No. 4	1.953"-1.954"	1.953"-1.954"		1.953"-1.954"		1.953"-1.954"	1.953"-1.954"
	No. 5	1.5625"-1.5635"	1.750"-1.751"		1.750"-1.751"		1.750"-1.751"	1.750"-1.751"
VALVE TIMING		2 Bbl. Carb.	2 Bbl. Carb.	4 Bbl. Carb.	2 Bbl. Carb.	4 Bbl. Carb.	4 Bbl. Carb.	4 Bbl. Carb.
Intake Opens (BTC)		19°	13°	24°	13°	24°	24°	24°
Intake Closes (ABC)		45°	59°	64°	59°	64°	64°	64°
Exhaust Opens (BBC)		59°	59°	64°	59°	64°	64°	64°
Exhaust Closes (ATC)		1°	13°	24°	13°	24°	24°	24°
Valve Overlap		20°	26°	40°	26°	40°	40°	40°
Intake Valve Duration		244°	252°	268°	252°	268°	268°	268°
Exhaust Valve Duration		240°	252°	268°	252°	268°	268°	268°
TIMING CHAIN								
Number of Links		68	50		50		50	50
Pitch		.375"	.50"		.50"		.50"	.50"
Width		1.02"	.88"		.88"		.88"	.88"

SPECIFICATIONS—(Continued)

	"318"	"361"	"383"	"413"	"426"
TAPPETS					
Type	Mechanical	Hydraulic	Hydraulic	Hydraulic	Hydraulic
Body Diameter	.9040"-.9045"	.9040"-.9045"	.9040"-.9045"	.9040"-.9045"	.9040"-.9045"
Clearance in Block	.0005"-.0015"	.0005"-.0015"	.0005"-.0015"	.0005"-.0015"	.0005"-.0015"
Service Tappets Available	Std., .001", .008", .030"	Std., .001", .008", .030"	Std., .001", .008", .030"	Std., .001", .008", .030"	Std., .001", .008", .030"
Operating Clearance (Hot)	.013" Intake	—	—	—	—
	.021" Exhaust	—	—	—	—
Clearance Between Valve Stem and Rocker Arm Pad (Dry Lash)	—	.060"-.210"	.060"-.210"	.060"-.210"	.060"-.210"
CYLINDER HEAD					
Valve Seat Run-Out (Maximum)	.002"	.002"	.002"	.002"	.002"
Intake Valve Seat Angle	45°	45°	45°	45°	45°
Seat Width (finish)	.060"-.085"	.060"-.085"	.060"-.085"	.060"-.085"	.060"-.085"
Exhaust Valve Seat Angle	45°	45°	45°	45°	45°
Seat Width (finish)	.040"-.060"	.040"-.060"	.040"-.060"	.040"-.060"	.040"-.060"
Cylinder Head Gasket (Thickness compressed)	.028"	.022"	.022"	.022"	.022"
VALVE GUIDES					
Type	Cast in Head	Cast in Head	Cast in Head	Cast in Head	Cast in Head
Guide Bore Diameter	.374"-.375" Std.	.374"-.375" Std.	.374"-.375" Std.	.374"-.375" Std.	.374"-.375" Std.
VALVES—(INTAKE)					
Head Diameter	1.844"	2.08"	2.08"	2.08"	2.08"
Length (to center of valve face)	4.51"	4.79"	4.79"	4.79"	4.79"
Stem Diameter (Standard)	.372"-.373"	.372"-.373"	.372"-.373"	.372"-.373"	.372"-.373"
Stem to Guide Clearance	.001"-.003"	.001"-.003"	.001"-.003"	.001"-.003"	.001"-.003"
Maximum Allowable	.004"	.004"	.004"	.004"	.004"
Face Angle	45°	45°	45°	45°	45°
Valve for Service	Std., .005", .015", .030" Oversize Stem Diam.	Std., .005", .015", .030" Oversize Stem Diam.	Std., .005", .015", .030" Oversize Stem Diam.	Std., .005", .015", .030" Oversize Stem Diam.	Std., .005", .015", .030" Oversize Stem Diam.
Lift (Zero Lash)	.403"	.392" 2 Bbl. / .430" 4 Bbl.	.392" 2 Bbl. / .430" 4 Bbl.	.430"	.430"
VALVES—(EXHAUST)					
Head Diameter	1.563"	1.60"	1.60"	1.60"	1.60"
Length (to center of valve face)	4.45"	4.79"	4.79"	4.79"	4.79"
Stem Diameter (Standard)	.3715"	.371"-.372"	.371"-.372"	.371"-.372"	.371"-.372"
Stem to Guide Clearance	.002"-.004"	.002"-.004"	.002"-.004"	.002"-.004"	.002"-.004"
Maximum Allowable	.006"	.006"	.006"	.006"	.006"
Face Angle	45°	45°	45°	45°	45°
Valve for Service	Std., .005", .015", .030" Oversize Stem Diam.	Std., .005", .015", .030" Oversize Stem Diam.	Std., .005", .015", .030" Oversize Stem Diam.	Std., .005", .015", .030" Oversize Stem Diam.	Std., .005", .015", .030" Oversize Stem Diam.
Lift (Zero Lash)	.390" 2 Bbl. / .430" 4 Bbl.	.390" 2 Bbl. / .430" 4 Bbl.	.430"	.430"	

SPECIFICATIONS—(Continued)

	"318"	"361"	"383"	"413"	"426"
VALVE SPRINGS					
Number	16	16	16	16	16
Free Length	1.92"	2.34"	2.34"	2.21"	2.21"
Load when compressed to (Valve closed)	49-57 lbs. @ 1 11/16"	95-105 lbs. @ 1 55/64"	95-105 lbs. @ 1 55/64"	85-95 lbs. @ 1 55/64"	85-95 lbs. @ 1 55/64"
Load when compressed to (Valve open)	137-150 lbs. @ 1 5/16"	187-203 lbs. @ 1 13/32"	187-203 lbs. @ 1 13/32"	216-234 lbs. @ 1 13/32"	216-234 lbs. @ 1 13/32"
Valve Springs I.D.	1.00"	1.010"-1.030"	1.010"-1.030"	1.070"-1.090"	1.070"-1.090"
Maximum Allowable out of Plumb	1/16"	1/16"	1/16"	1/16"	1/16"
Valve Spring Installed Height (spring seat to retainer)	1 5/8" to 1 11/16"	1 53/64" to 1 57/64"	1 53/64" to 1 57/64"	1 53/64" to 1 57/64"	1 53/64" to 1 57/64"
Use to 1/16" spacer to reduce spring height when over specifications.					
ROCKER SHAFT ASSEMBLY					
Clearance Between Rocker Arm and Shaft	.001"-.003"	—	—	—	—
Clearance Between Rocker Shaft and Bracket	.001"-.0045"	.0005"-.003"	.0005"-.003"	.0005"-.003"	.0005"-.003"
ENGINE LUBRICATION					
Pump Type	Rotary Full Pressure	Rotary Full Pressure	Rotary Full Pressure	Rotary Full Pressure	Rotary Full Pressure
Capacity (qts.)	4*	4*	4*	4*	4*
Pump Drive	Camshaft	Camshaft	Camshaft	Camshaft	Camshaft
Minimum Pump Pressure at 500 R.P.M.	20 PSI	20 PSI	20 PSI	20 PSI	20 PSI
Operating Pressure at 1000 R.P.M.	45-65 lbs.	45-65 lbs.	45-65 lbs.	45-65 lbs.	45-65 lbs.
Pressure Drop Resulting from Clogged Filter	7-9 lbs.	7-9 lbs.	7-9 lbs.	7-9 lbs.	7-9 lbs.
Oil Filter Type	Full-Flow	Full-Flow	Full-Flow	Full-Flow	Full-Flow

*When Filter Element is Replaced, add 1 quart.

OIL PUMP—INSPECTION LIMITS FOR REPLACEMENT

	318 Cu. In. Engines	361, 383, 413, and 426 Cu. In. Engines
Oil Pump Cover	.0015 inch or more	.0015 inch or more
Outer Rotor Length	.825 inch or less	.943 inch or less
Outer Rotor Diameter	2.469 inch or less	2.469 inch or less
Inner Rotor Length	.825 inch or less	.942 inch or less
Clearance Over Rotors—Outer	.004 inch or more	.004 inch or more
Inner	.004 inch or more	.005 inch or more
Outer Rotor Clearance	.012 inch or more	.012 inch or more
Tip Clearance Between Rotors	.010 inch or more	.010 inch or more

OVERSIZE AND UNDERSIZE

ENGINE COMPONENT MARKINGS

Engine Displacement	Condition	Identification	Location of Identification
318 cu. in.	.001" U/S Crankshaft	Maltese Cross M-2-3 etc. (indicating No. 2 & 3 main bearing journal) and/or R-1-4 etc. (indicating No. 1 & 4 connecting rod journal)	Following engine serial number Crankshaft counterweight
	.010" U/S Crankshaft	B M (indicates .010" U/S all main journals) and/or R (indicating .010" U/S all rod journals)	Following engine serial number Crankshaft counterweight
	.020" O/S Cylinder Bores	A	Following engine serial number
	.008" O/S Tappets	♦	Following engine serial number
361 cu. in. 383 cu. in. 413 cu. in. 426 cu. in.	.001" U/S Crankshaft	Maltese Cross M-2-3 etc. (indicating No. 2 & 3 main bearing journal) and/or R-1-4 etc. (indicating No. 1 & 4 connecting rod journals)	Top pad—Front of engine Crankshaft counterweight
	.010" U/S Crankshaft	Maltese Cross and X M-10 (indicates .010" U/S all main journals) and/or R-10 (indicates .010" U/S all rod journals)	Top pad—Front of engine Crankshaft counterweight
	.020" O/S Cylinder Bores	A	Top pad—Front of engine
	.008" O/S Tappets	♦	Top pad—Front of engine
	.005" O/S Valve Stems	O.S.	Single bolt boss on end of the head

SPECIAL TOOLS

318 CUBIC INCH ENGINE

C-119	Cylinder Bore Gauge
C-385	Ring Compressor
C-647	Spring Tester
C-690	Spring Scale
C-756	Valve Guide Cleaner
C-823	Cylinder Resizing Hone
C-897	Driver
C-3012	Cylinder Ridge Reamer
C-3025	Intake Valve Guide Wear Checking Sleeve
C-3026	Exhaust Valve Guide Wear Checking Sleeve
C-3028	Tappet Bore Reamer
C-3049	Piston Pin Reamer
C-3052	Distributor Drive Shaft Bushing Puller
C-3053	Distributor Drive Shaft Bushing Installer
C-3054	Spark Plug Socket
C-3059	Bearing Remover
C-3068	Tappet and Push Rod Carrier
C-3132A	Camshaft Bearing Remover and Installer
C-3167	Engine Repair Stand
C-3221	Piston Remover and Installer
C-3339	Dial Indicator
C-3422A	Valve Spring Compressor
C-3427	Valve Guide Reamer .030" O.S.
C-3430	Valve Guide Reamer .015" O.S.
C-3433	Valve Guide Reamer .005" O.S.
C-3466	Lifting Bracket
C-3487	Engine Support Fixture
C-3501	Cylinder Hone
C-3506	Chain Case Cover Seal Installer and Remover
C-3509	Camshaft Gear Holding Tool
C-3511	Rear Main Bearing Seal Installer
C-3586	Ring Installer
C-3626	Cylinder Head Holding Fixtures
C-3662	Engine Repair Stand Adapter
C-3688	Vibration Damper Puller-Installer
C-3695	Compressor Rocker Arm
C-3841	Alternator Belt Adjusting Tool
C-3927	Valve Stem Length Gauge

SPECIAL TOOLS

361, 383, 413 & 426 CUBIC INCH ENGINES

C-119	Cylinder Bore Indicator
C-385	Piston Ring Compressor
C-647	Valve Spring Testing Fixture
C-756	Valve Guide Cleaner
C-823	Cylinder Bore Resizing Hone and 390 Extensions Necessary with 383, 413 and 426 Engines
C-897	Core Hole Plug Driver
C-3025	Intake Valve Guide Wear Checking Sleeve
C-3026	Exhaust Valve Guide Wear Checking Sleeve
C-3028	Tappet Bore Reamer
C-3052	Distributor Drive Shaft Bushing Puller
C-3053	Distributor Drive Shaft Bushing Installer-Burnisher
C-3054	Spark Plug Socket
C-3059	Main Bearing Upper Shell Remover and Replacer
C-3068	Tappet and Push Rod Carrier
C-3132A	Camshaft Bearing Remover and Replacer
C-3160	Tappet Checking Pliers
C-3167	Engine Repair Stand
C-3221	Piston and Connecting Rod Remover and Replacer
C-3339	Dial Indicator
C-3012	Cylinder Ridge Reamer
C-3422A	Valve Spring Compressor
C-3427	Valve Guide Reamer (.030" O.S.)
C-3430	Valve Guide Reamer (.015" O.S.)
C-3433	Valve Guide Reamer (.005" O.S.)
C-3466	Engine Lifting Plate
C-3487	Engine Support Fixture
C-3501	Cylinder Bore Deglazing Hone
C-3506	Chain Case Cover Oil Seal Remover and Replacer
C-3509	Camshaft Gear Installer
C-3625	Rear Main Bearing Oil Seal Installer (361 and 383 cubic inch engine)
C-3626	Cylinder Head Holding Fixtures
XsY121	Piston Ring Remover and Replacer (361 cubic inch engine)
C-3648	Valve Stem Length Gauge
C-3661	Tappet Remover
C-3662	Engine Repair Stand Adapter
C-3671	Piston Ring Remover and Replacer (413 cubic inch engine)
C-3673	Piston Ring Remover and Replacer (383 cubic inch engine)
C-3684	Piston Pin Remover and Replacer
C-3688	Engine Front End Puller Kit
C-3743	Rear Main Bearing Oil Seal Installer (413 and 426 cubic inch engine)
C-3845	Oil Filter Remover

TORQUE REFERENCE

318 CUBIC INCH ENGINE

	Torque Foot-Pounds	Thread Size
Connecting Rod Nut—Plain	45	3/8-24
Cylinder Head Bolt	85	1/2-13
Main Bearing Cap	85	1/2-13
Camshaft Nut	125	
Camshaft Lockbolt	35	
Camshaft Thrust Plate	210 in.-lbs.	5/16-18
Chain Case Cover (Cast)	35	3/8-16
Clutch Housing Bolt	30	3/8-16
Clutch Housing Vent Hole	100 in.-lbs.	1/4-20
Clutch Housing Pan Drain Plug	35	
Crankcase Vent Outlet Pipe	15 in.-lbs.	5/16-24
Crankshaft Bolt	135	3/4-16
Cylinder Head Cover	36 in.-lbs.	
Engine Front Mounting		
To Engine Bosses	45	
To Frame	85	
To Frame Bracket Stud	20	
Engine Rear Mounting		
To Transmission	35	
To Frame	35	
Flywheel Housing to Cylinder Block	50	
Flywheel Housing Cover	100 in.-lbs.	1/4-20
Intake Manifold	40	3/8-16
Oil Level indicator Tube Bracket	130 in.-lbs.	1/4-28
Oil Pan Drain Plug	35	7/8-18
Oil Pan Bolt	15	5/16-18
Oil Pump Cover Bolt	15	1/4-20
Oil Pump Attaching Bolt	35	3/8-16
Oil Filler Tube	30	
Vibration Damper Bolt	200 in.-lbs.	5/16-24

TORQUE REFERENCE

361, 383, 413, 426 CUBIC INCH ENGINES

	Torque Foot-Pounds	Thread Size
Connecting Rod Nut—Plain	45	3/8-24
Cylinder Head Bolt	70	7/16-14
Main Bearing Cap Bolt	85	1/2-13
Spark Plug	30	14mm
Camshaft Lockbolt	35	7/16-14
Carburetor to Manifold Nut	7	5/16-24
Chain Case Cover Bolt	15	5/16-18
Torque Converter Housing Bolt	30	3/8-16
Clutch Housing Bolt	30	3/8-16
Crankshaft Rear Bearing Seal Retainer	30	3/8-16
Crankshaft Bolt (Vibration Damper)	135	3/4-16
Cylinder Head Cover Stud and Nut	40 in.-lbs	1/4-28
Distributor Clamp Bolt	15	5/16-18
Engine Front Mounting to Frame Nut	85	1/2-20
Engine Front Mounting to Block Nut	45	7/16-20
Exhaust Manifold Nut	30	3/8-16
Exhaust Pipe Flange Nut	40	7/16-20
Exhaust Pipe Clamp Bolt	20	3/8-24
Exhaust Pipe Support Clamp Bolt	20	3/8-24
Fan Attaching Bolt	15-18	5/16-18
Fan Belt Idler Pulley Nut	45	7/16-20
Fan Belt Idler Pulley Bracket Bolt	30	3/8-16
Flywheel Housing to Cylinder Block Bolt	50	7/16-14
Flywheel Housing Cover Bolt	7	1/4-20
Fuel Pump Attaching Bolt	30	3/8-16
Alternator Mounting Nut	20	5/16-24
Alternator Adjusting Strap Bolt	15	5/16-18
Alternator Adjusting Strap Mounting Bolt	30	3/8-16
Intake Manifold Bolt	50	3/8-16
Manifold Heat Control Counterweight Bolt	50 in.-lbs.	10-32
Oil Pan Drain Plug	35	5/8-18
Oil Pan Bolt	15	5/16-18
Oil Pump Cover Bolt	10	5/16-18
Oil Pump Attaching Bolt	35	3/8-16
Rocker Shaft Bracket Bolt	30	3/8-16
Starter Mounting Bolt	50	7/16-14
Vibration Damper Bolt	15	5/16-18
Valve Tappet Cover End Bolt	9	1/4-20
Water Pump to Housing Bolt	30	3/8-16
Water Pump Housing to Cylinder Block Bolt	30	3/8-16
A/C Compressor to Engine Bolt	30	3/8-16

PART 2

V8 ENGINES

Seven V-8 engines are used for Plymouth Models. The engines differ in piston displacement, bore diameter, power output and carburetor equipment. All engines are equipped with valves in head.

The 318 cubic inch engine has a 9.0 to 1 compression ratio, mechanical tappets and is equipped with a two bore carburetor using regular fuel.

There are two 361 cubic inch engines available. Both engines have a 9.0 to 1 compression ratio and hydraulic tappets. One is equipped with a two bore carburetor and uses regular fuel, and one is equipped with a four bore carburetor, hi-performance camshaft and valve springs using premium fuel.

There are two 383 cubic inch engines and both engines have a 10.0 to 1 compression ratio and hydraulic tappets. One is equipped with a two bore carburetor and uses regular fuel, and one is equipped with a four bore carburetor, hi-performance camshaft and valve springs using premium fuel.

The 413 cubic inch engine has a 10.0 to 1 compression ratio, hydraulic tappets, hi-performance camshaft and valve springs using premium fuel.

The 426 cubic inch engine has a 10.5 to 1 compression ratio, hydraulic tappets, hi-performance camshaft and valve springs using premium fuel.

The engine oiling system consists of a rotor type oil pump and a full flow oil filter. 318 cubic inch engine pump is mounted internally and 361, 383-426 cubic inch engines are mounted externally. Oil is forced by the oil pump to a series of oil passages in the engine, as shown in figures 61 and 62.

SERVICE PROCEDURES

1. TUNE-UP

(1) Test the battery specific gravity, add water if necessary, clean and tighten the battery connections.

(2) Test the cranking voltage if below 9.6 volts and more than 130 amperes draw see Starting Motor Cranking Voltage Electrical Section of this manual.

(3) Tighten the intake manifold bolts to 40 foot-pounds torque for 318 cubic inch engine and 50 foot-pounds torque for 361, 383, 413 and 426 cubic inch engines.

(4) Perform the cylinder compression test. The compression should not vary more than 20 pounds for any one engine.

(5) Clean or replace the spark plugs as necessary and adjust the gap to .035 inch. Tighten to 30 foot-pounds torque using new gaskets.

(6) Test the resistance of the spark plug cables and if the resistance is more than 30,000 ohms, replace the cable.

(7) Remove the distributor. Clean the cap and rotor. Inspect for carbon tracking, cracks and corrosion. Inspect the breaker plate, points, lead wire and vacuum advance, replace if necessary. Adjust to specifications. Test coil and condenser.

(8) Install the distributor, distributor cap, and spark plug cables. Reset the ignition timing with the vacuum advance line disconnected. The ignition timing should be set to compensate for altitudes and/or gasoline grades as follows:

A. At low altitudes, with any good grade of the recommended gasoline, either "regular" or "premium", the engine will give its best performance if timed according to specifications.

B. When using lower grade fuels, or after carbon has accumulated, objectionable spark ping may occur with the specified timing. In cases of this nature, ignition timing should be retarded, but not to exceed 5 degrees of crankshaft rotation later than specified.

C. At high altitudes or when using higher quality gasoline, for example "premium" where "regular" is specified, or "super premium" where premium is specified, there is less tendency for spark ping. In such cases, improved performance may be obtained by advancing the spark not to exceed 5 degrees of crankshaft rotation ahead of specified timing.

NOTE: It is recommended, however, that the vehicle operating at high speeds or hauling trailers have the ignition timing set at not over the specified setting.

D. Within the foregoing limits, namely, from 5 degrees ahead to 5 degrees later than specified timing, a good rule to follow is to advance the spark until a slight ping is heard when accelerating from 15 mph in direct drive at wide open throttle.

(9) Set carburetor idle mixture adjustment. Ad-

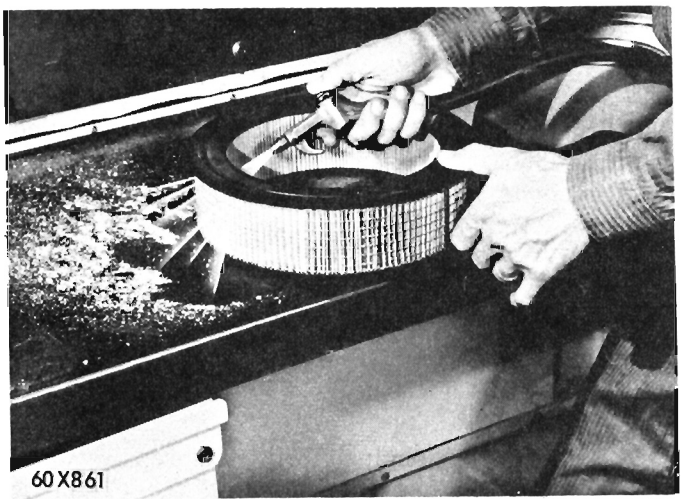


Fig. 1—Cleaning Filter Element

just the throttle stop screw to specifications. Perform a combustion analysis.

(10) Test the fuel pump for pressure and vacuum. Refer to "Fuel System" Group 14, Specifications.

(11) Inspect the manifold heat control valve in the right exhaust manifold for proper operation and apply Manifold Heat Control Valve Solvent Part Number 1879318 to the bushing and shaft.

(12) Every 6 months, remove the air cleaner filter element and blow out dirt gently with air hose. Direct air from inside out, and keep nozzle 2 inches away from element to avoid damaging. Clean the metal housing and replace the element (Fig. 1). Every 32,000 miles, install a new factory recommended MoPar filter element. Service the unit more frequently when driving under severe conditions, such as in dusty areas.

(13) Inspect and adjust the accessory belt drives referring to "Cooling System," Group 7, for proper adjustments.

(14) Road test the vehicle as a final test.

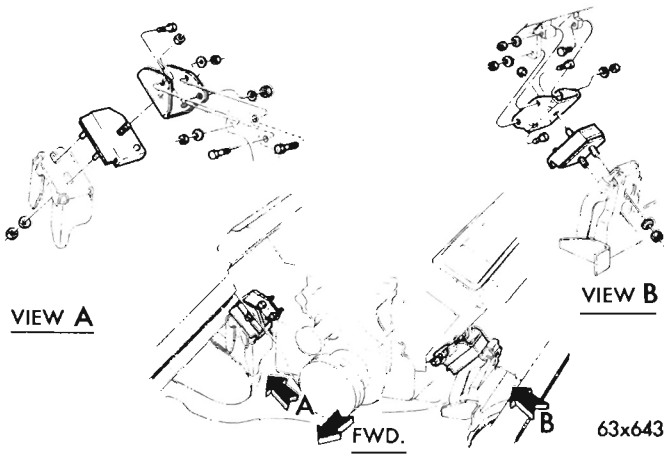


Fig. 2—Engine Front Mounts (318 Cubic Inch)

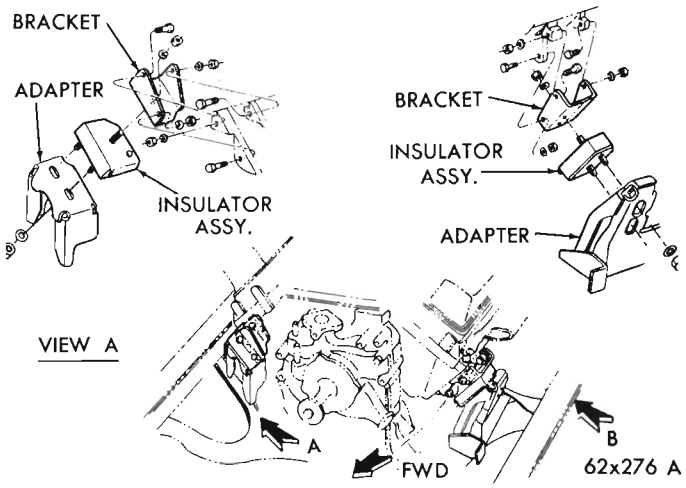


Fig. 3—Engine Front Mounts (361, 383, 413 & 426 Cubic Inch)

2. FRONT ENGINE MOUNTS (Figs. 2 and 3)

Removal

(1) Disconnect throttle linkage at transmission and at carburetor.

(2) Raise hood and position fan to clear radiator hose and radiator top tank.

(3) Remove prevailing torque nuts from insulator studs.

(4) Raise the engine just enough to remove front engine mount assembly.

Installation

(1) Install insulator to engine bracket and tighten to 75 foot-pounds torque.

(2) Lower the engine and install washers and prevailing torque nuts to insulator studs; tighten nuts to 75 foot-pounds torque.

(3) Connect throttle to transmission and to carburetor linkage.

3. REAR ENGINE MOUNT (Fig. 4)

Removal

(1) Raise vehicle on hoist.

(2) Install transmission jack.

(3) Remove rear engine crossmember from frame and remove rear mount.

Installation

(1) Install rear engine mount to crossmember and tighten nut to 150 inch-pounds torque.

(2) Install rear crossmember to frame and tighten bolts to 75 foot-pounds torque.

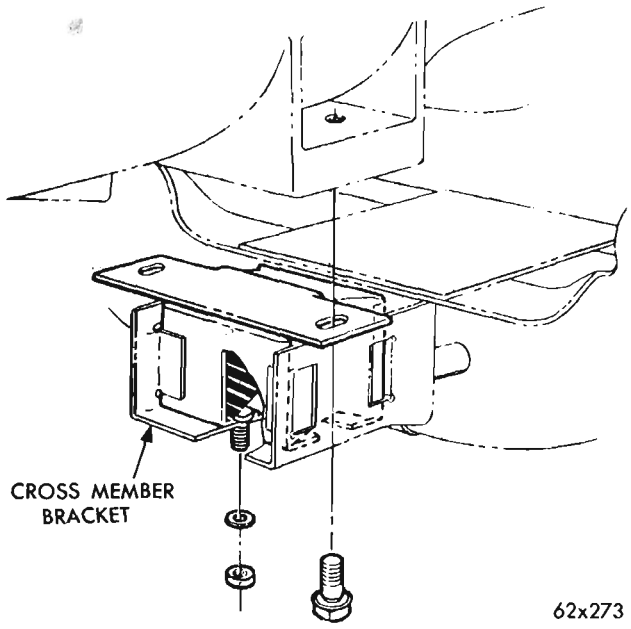


Fig. 4—Engine Rear Mounts

(3) Remove transmission jack.

(4) Install rear engine mount to transmission bolts and tighten to 35 foot-pounds torque.

(5) Lower the vehicle.

4. ENGINE ASSEMBLY

Removal

(1) Scribe the outline of the hinge brackets on the hood to assure proper adjustment when installing. Remove the hood.

(2) Drain the cooling system and remove the battery.

(3) Remove all hoses, the fan shroud (on air conditioned vehicles), oil cooler lines and radiator.

(4) Disconnect the fuel lines, linkage and wires attached to engine units and remove the air cleaner and carburetor.

(5) Attach the engine lifting fixture Tool C-3466 to the carburetor flange studs on the intake manifold.

(6) Raise the vehicle on a hoist and install the engine support fixture Tool C-3487 on the chassis to support the rear of the engine.

(7) Drain the transmission.

(8) Disconnect the exhaust pipes at the manifolds, propeller shaft, wires linkage, speedometer cable, and the oil cooler lines at the transmission.

(9) Remove the engine rear support crossmember and remove the transmission from the vehicle.

(10) Lower the vehicle and attach a crane or other suitable lifting tool to the fixture eyebolt.

(11) Remove the engine front mounts. Raise the engine with lifting tool and work engine out of the chassis.

(12) Place the engine in repair stand C-3167 and adapter C-3662 for disassembly using transmission mounting bolts.

Installation

(1) Attaching the engine lifting fixture Tool C-3466 to the carburetor flange studs on intake manifold.

(2) Attach a crane or other suitable lifting tool to the fixture eyebolt.

(3) Remove the engine from the repair stand and lower the engine carefully until the engine is positioned in the chassis with front engine mounts in place.

(4) Install the engine support fixture Tool C-3487 on the chassis to support the rear of the engine. Remove the crane.

(5) Raise the vehicle on a hoist, install the transmission, engine rear support crossmember, tighten front engine mounts, remove the engine support fixture, Tool C-3487.

(6) Connect the propeller shaft, wires, linkage, speedometer cable, oil cooler lines at the transmission, connect exhaust pipes to manifolds. Install the transmission filler tube.

(7) Lower the vehicle and remove the engine lifting fixture Tool C-3466 from the engine. Install the carburetor and fuel lines.

(8) Install the radiator, fan shroud, hoses, oil cooler lines and connect all wires and linkage.

(9) Install the hood using scribe marks for the proper alignment.

(10) Close all the drain cocks and fill cooling system, install battery.

(11) Fill the engine crankcase and transmission. Refer to "Lubrication" Group 0, for quantities and lubricants to use. Inspect the entire system for leaks and correct as necessary.

NOTE: Whenever an engine has been rebuilt and/or a new camshaft and/or new tappets have been installed, add one quart of MoPar Engine Supplement Part Number 1879406 to engine oil to aid break-in. The oil mixture should be left in engine for a minimum of 500 miles, and drained at the next normal oil change.

(12) Start the engine and run until normal operating temperature is reached.

(13) On **318 Cubic inch engine** only adjust the tappets.

(14) Test the timing (with vacuum advance line removed) and adjust carburetor, transmission linkage as necessary. Connect vacuum line install air cleaner and road test the vehicle.

5. CYLINDER HEAD ASSEMBLY

Removal

(1) Drain the cooling system. Remove the carburetor air cleaner, fuel line, alternator and distributor vacuum line.

(2) Disconnect the throttle linkage, coil wires, heat indicator sending unit wire, heater hoses at the engine.

(3) Remove the distributor cap and the spark plug cables and the engine closed vent system.

(4) Remove the intake manifold attaching bolts and remove the manifold, carburetor and coil as an assembly.

(5) On **361, 383, 413 and 426 Cubic inch engines** only, remove the tappet chamber cover and spark plugs located under the exhaust manifolds.

(6) Remove the cylinder head covers, closed vent system and exhaust manifolds. (All engines.)

(7) On **361, 383, 413 and 426 Cubic inch engines** only, remove the rocker arms and shaft assemblies, push rods and place them in their respective slots in holder, Tool C-3068.

(8) Remove head bolts from each cylinder head and remove cylinder heads. Place cylinder heads in holding fixture, Tool C-3626.

NOTE: The 318 Cubic Inch Engine push rods are removed with cylinder head and rocker arm assemblies.

Installation

(1) Inspect all surfaces with a straightedge if there is any reason to suspect leakage.

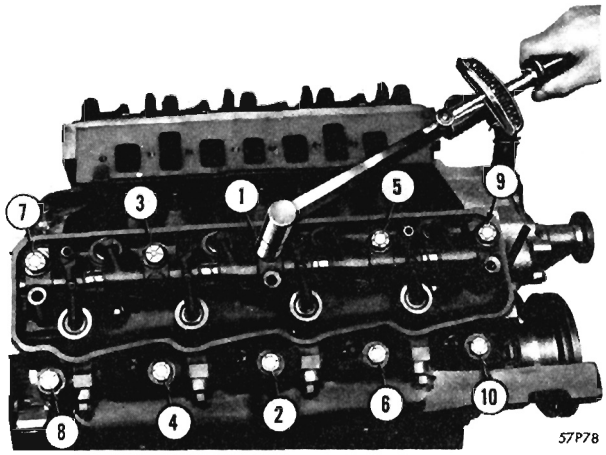


Fig. 5—Cylinder Head Tightening Sequence (318 Cubic Inch)

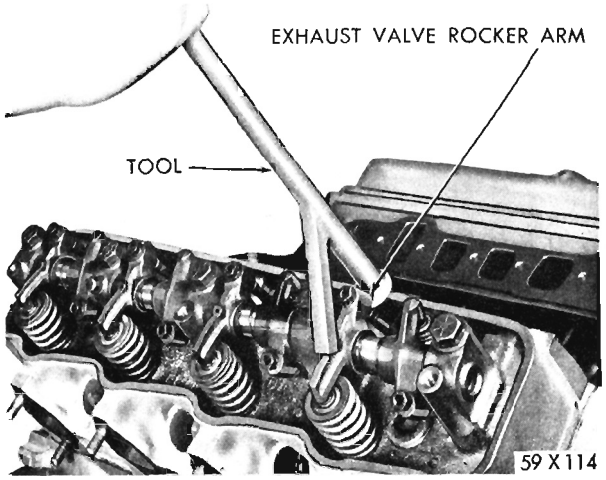


Fig. 6—Compressing Exhaust Valve Spring (Tool C-3695)

(2) Coat the new gaskets with Mopar Sealer Part Number 1122893.

(3) Remove the cylinder heads from the holding fixtures Tool C-3626 and install on the engine.

(4) **318 Cubic Inch Engine** a. Install and tighten all head bolts starting at top center, to 85 foot-pounds torque sequence, as shown in Figure 5. Repeat the procedure, retightening all head bolts to 85 foot-pounds torque.

b. Install the push rods with the small ends in the tappets. When using Tool C-3695 (Fig. 6), rocker arm valve spring compressor, to position large end of push rod under rocker arm, **make certain low point of camshaft is under tappet.**

c. Install new intake manifold gaskets and seals.

(5) **361, 383, 413 and 426 Cubic Inch Engines** a. Torque all head bolts to 70 foot-pounds torque in sequence, as shown in Figure 7. Repeat the procedure retighten all head bolts to 70 foot-pounds torque.

b. Install the push rods with small ends in tappets maintaining alignment using rod, as shown in Figure 8.

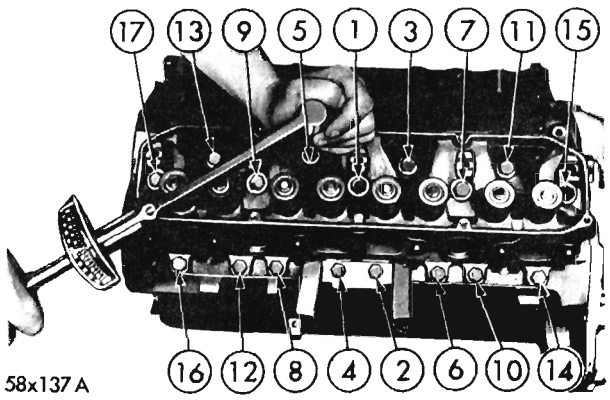


Fig. 7—Cylinder Head Tightening Sequence (361, 383, 413 & 426 Cu. In.)

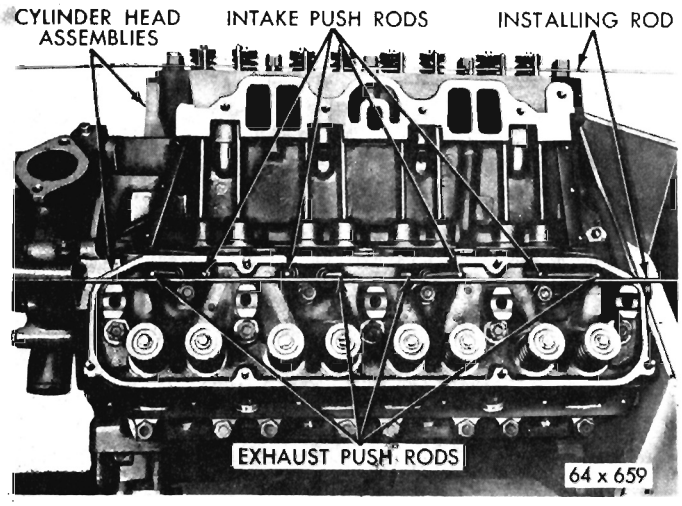


Fig. 8—Push Rods Installed (361, 383, 413 & 426 Cubic Inch)

C. Install the rocker arm and shaft assembly starting each push rod into its respective rocker arm socket making sure to install the long stamped steel retainers in the number two and four positions.

CAUTION: Use Extreme care in tightening bolts to 30 foot-pounds torque so the tappets have time to bleed down to their operating length. Bulged tappet bodies, bent push rods, and permanently noisy operation may result if tappets are forced down too rapidly.

d. Install tappet chamber cover and tighten end bolts to 9 foot-pounds torque.

e. Install the valve covers with new gaskets and tighten to 40 inch-pounds torque.

(6) Install the intake manifold, tighten manifold bolts to 40 foot-pounds torque for 318 cubic inch engine and 50 foot-pounds torque for 361, 383, 413 and 426 cubic inch engines.

(7) Install the exhaust manifolds, use new gaskets on the 318 cubic inch engine, no gaskets are required for the 361, 383, 413 and 426 cubic inch engines, tighten to 30 foot-pounds torque.

(8) Install the spark plugs with new gaskets. Tighten to 30 foot-pounds torque.

(9) Install the distributor cap and spark plug cables and the engine closed vent system.

(10) Install the carburetor and the coil (if removed), throttle linkage, coil wires, heat indicator sending unit wire, and the heater hoses.

(11) Install alternator, distributor vacuum line, fuel line, and carburetor air cleaner.

(12) Fill the cooling system. Start the engine and run until normal operating temperature is reached.

(13) **318 Cubic Inch Engine** Adjust the tappets to .013 inch for intake and .021 inch for exhaust. Install the valve covers with new gaskets, tighten to 40 inch-pounds torque.

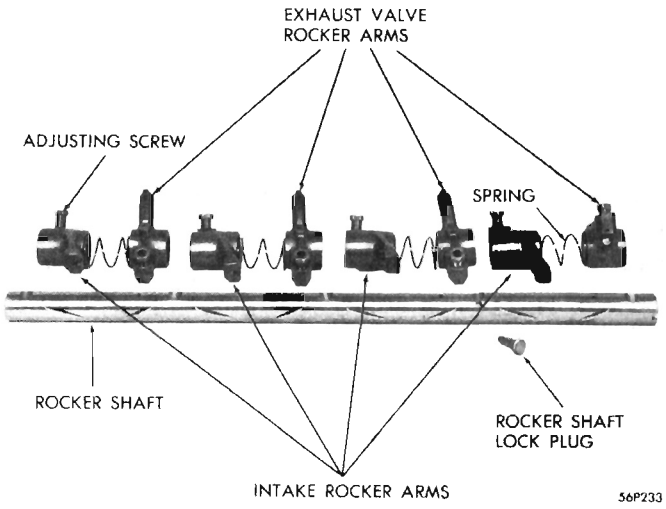


Fig. 9—Rocker Shaft Assembly (318 Cubic Inch)

6. ROCKER ARMS AND SHAFT

Removal (318 Cubic Inch Engine)

For cleaning, inspection or installation of new parts, remove the cylinder heads from the engine on 318 Cubic Inch Engines. Refer to Paragraph 5.

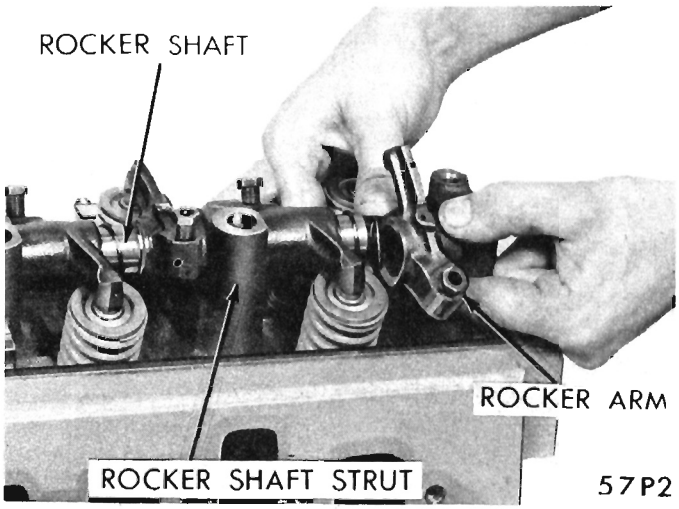


Fig. 10—Installing Rocker Arms (318 Cubic Inch)

Remove the lock plug, slide rocker shaft out of rocker shaft struts disengaging rocker arms and springs. (Fig. 9).

Installation

Slide the rocker shaft into bore of strut and at the same time engage intake rocker arm (Fig. 10). Install spring and engage exhaust rocker arm. Install remainder of the rocker arms in same sequence. Make sure that head bolt holes in rocker shaft line up with head bolt holes in rocker shaft strut. In addition, the plug hole in strut must also line up with hole in rocker shaft. Tap in rocker arm shaft plug. (Fig. 11). Install plugs in both ends of rocker arm shaft.

Removal (361, 383, 413, 426 Cubic Inch Engine)

(1) Remove the cylinder head cover and gasket.

(2) Remove the bolts that attach the rocker arm shaft to the cylinder head and remove the rocker arms and shaft as an assembly.

(3) If the rocker arm assemblies have been disassembled for cleaning, inspection, or replacement, refer to Figure 12 for proper reassembly.

Installation

Install the rocker shafts so that the $\frac{3}{16}$ inch diameter rocker arm lubrication holes point downward into the rocker arm, and so that the 15° angle of these holes point outward towards the valve end of the the rocker arms. (See Fig. 13).

NOTE: The 15° angle of the rocker arm lubrication holes is determined from the center line of the bolt holes through the shaft which are used to attach the shaft assembly to the cylinder head.

(1) Install the rocker arms and shaft assembly making sure to install the long stamped steel retainers in the number two and four positions.

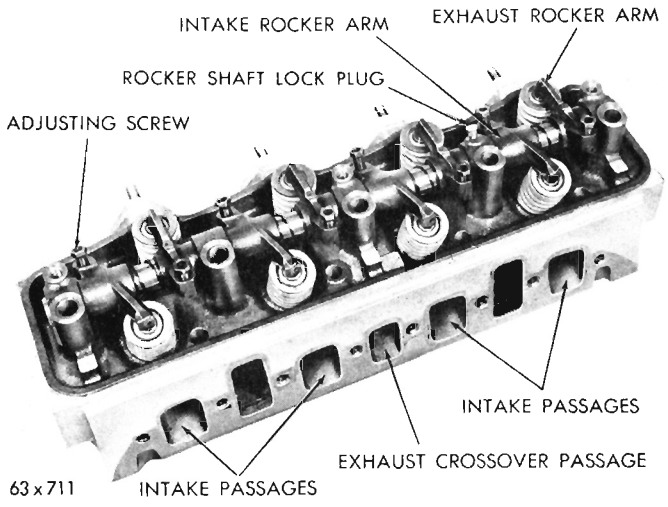


Fig. 11—Cylinder Head Assembly (318 Cubic Inch)

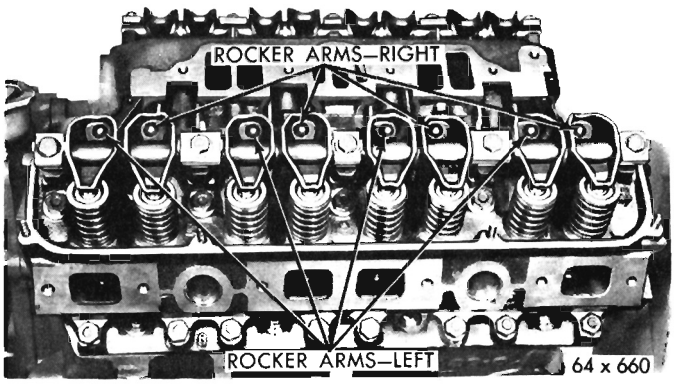


Fig. 12—Rocker Arms Installed

NOTE: Use extreme care in tightening the bolts so that tappets have time to bleed down to their operating length. Bulged tappet bodies, bent push rods and permanent noisy operation may result if the tappets are forced down too rapidly.

(2) Tighten the bolts to 30 foot-pounds torque.

7. VALVES AND VALVE SPRINGS

NOTE: Intake and exhaust valves operate in guides that are integral with the heads.

Removal

(1) With the cylinder head removed, compress the valve springs, using Tool C-3422A, as shown in Figure 14.

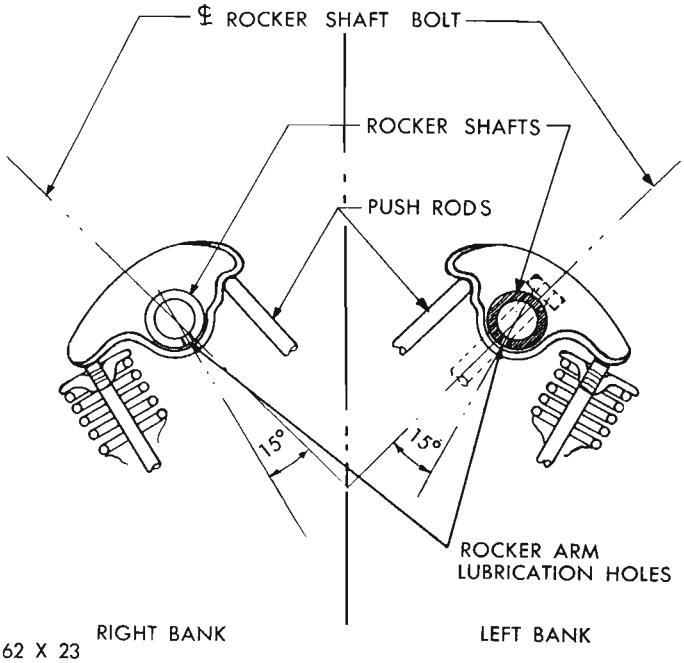


Fig. 13—Rocker Arm Lubrication Holes

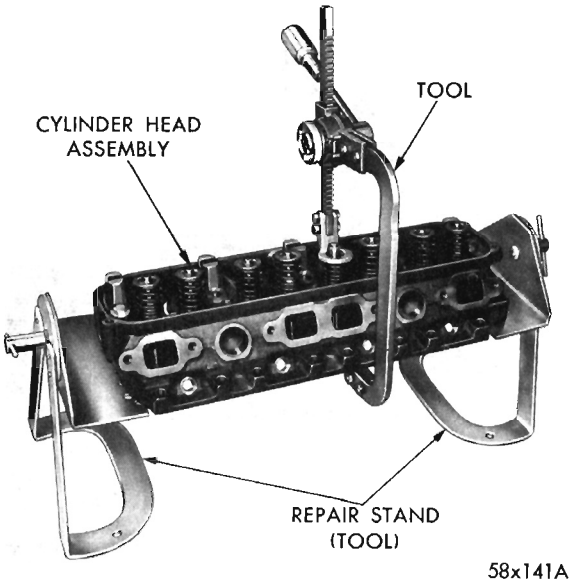


Fig. 14—Compressing Valve Spring Using Tool C-3422A (Typical)

(2) Remove the valve retaining locks, valve spring retainers, valve stem cup seals and valve springs.

NOTE: Remove any burrs from the valve stem lock grooves to prevent damage to the valve guide when the valves are removed.

Valve Inspection

(1) Clean the valves thoroughly, and discard burned, warped and cracked valves.

(2) Measure the valve stems for wear. The new intake valve stem diameter should measure .372 to .373 inch and exhaust valve stem diameter should measure .371 to .372 inch. If the wear exceeds .002 inch, replace the valve.

(3) Remove the carbon and varnish deposits from the inside of the valve guides with cleaner, Tool C-756.

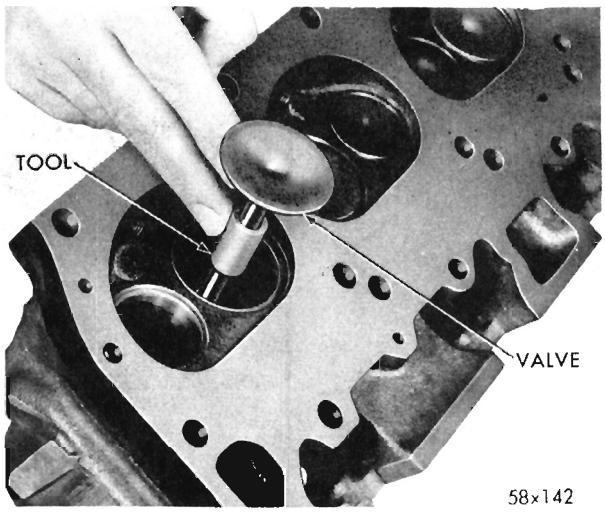


Fig. 15—Installing Tool C-3026 (Typical)

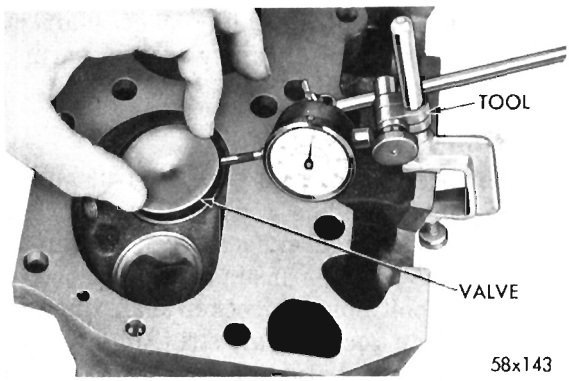


Fig. 16—Measuring Guide Wear Using Tool C-3339 (Typical)

(4) Measure the valve stem guide clearance as follows: Install sleeve, Tool C-3025 on intake valve and Tool C-3026 on exhaust valve over valve stem to hold valve at working height in head, as shown in Fig. 15.

(5) The special sleeve places the valve at the correct height for measuring with a dial indicator. Attach the dial indicator Tool C-3339 to cylinder head and set it at a right angle to the valve stem being measured (Fig. 16). Move valve to and from the indicator. Total movement should not exceed .008 inch on intake valves and .014 inch on exhaust valves for 318 Cubic Inch Engine and .010 inch on intake valve, and .014 inch on the exhaust valves for 361, 383, 413 and 426 Cubic Inch Engine.

(6) If the tolerance is excessive, ream guides and install valve with oversize stems. Reamer Tool C-3433 will ream guides for .005 inch oversize valve stems. Tool C-3430 for .015 inch oversize, Tool C-3427 for .030 inch oversize. Turn reamer by hand, and clean guides thoroughly when finished. Use .005 inch reamer first and, if necessary, the .015 inch, then the .030 inch so the guides remain true in relation to the seat.

Refacing Valves and Valve Seats

The intake and exhaust valve faces have a 45° angle. Always inspect the remaining margin after the valves are refaced (Fig. 17). Valves with less than $\frac{3}{64}$ inch margin should be replaced.

(1) The angle of both valve and seat should be identical. When refacing the valve seats it is important that the correct size valve guide pilot be used for reseating stones. A true and complete surface must be obtained.

(2) Measure the concentricity of the valve seat using dial indicator No. 13725. The total runout should not exceed .003 inch (total indicator reading).

(3) Inspect the valve seat with Prussian Blue to

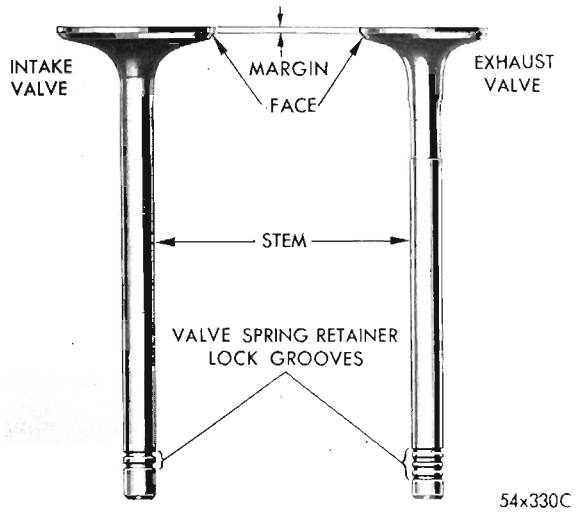


Fig. 17—Intake and Exhaust Valve Faces

determine where the valve contacts the seat. To do this, coat the valve seat **lightly** with Prussian Blue then set the valve in place. Rotate the valve with light pressure. If the blue is transferred to the center of the valve face, the contact is satisfactory. If the blue is transferred to the top edge of the valve face, lower the valve seat with a 30° stone. If the blue is transferred to the bottom edge of the valve face raise the valve seat with a 60° stone.

(4) When the seat is properly positioned the width of the intake seats should be 1/16 to 3/32 inch. The width of the exhaust seats should be 3/64 to 1/16 inch.

(5) When the valves and seats are reground, the position of the valve in the cylinder head is changed, the valve stems will extend farther out of the cylinder heads. This increased dimension will decrease valve spring compression, and also for 361, 383, 413 and 426 Cubic Inch Engines only it will shorten the operating length of the hydraulic tappet. This means that the plunger is operating closer to its bottomed position, and less clearance is available for thermal expansion of the valve mechanism during high speed driving.

(6) The design of the valve mechanism includes a safety factor to allow for a limited amount of wear, and the refacing of valves and seats.

(7) To insure that the limits have not been exceeded, the dimension from valve spring seat in head to valve tip should be measured with gauge Tool C-3927 for 318 Cubic Inch Engine and gauge Tool C-3648 for 361, 383, 413 and 426 Cubic Inch Engines, as shown in Figure 18.

If the valve stem extends above the gauge, grind the end of the stem to fall between the maximum and the minimum.

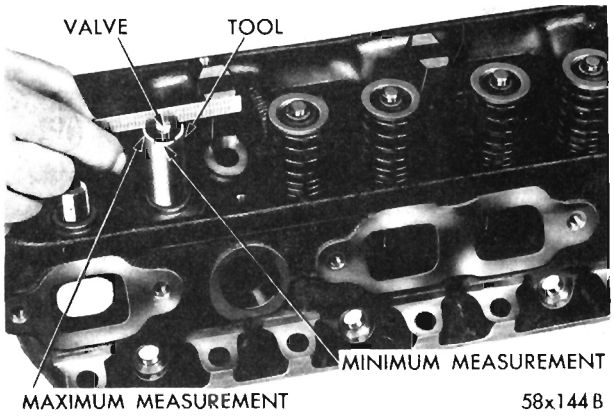


Fig. 18—Measuring Valve Stem Length (Typical)

Testing Valve Springs

(1) Whenever the valves have been removed for inspection, reconditioning or replacement, the valve springs should be tested. To test a spring, determine the length at which the spring is to be tested. As an example, the compressed length of the spring to be tested is $1\frac{15}{32}$ inches. Turn the table of Tool C-647 until surface is in line with the $1\frac{15}{32}$ inch mark on the threaded stud and the zero mark to the front. Place spring over stud on table and lift the compressing lever to set the tone device. Pull on torque wrench until a ping is heard. Take the reading on torque wrench at this instant. Multiply this reading by two. This will give the spring load at the test length. Fractional measurements are indicated on the table for finer adjustments. The valve springs should test 49 to 57 pounds when compressed to $1\frac{11}{16}$ inches and 137 to 150 when compressed to $1\frac{5}{16}$ inches for 318 cubic inch engine. For 361, 383, 413 and 426 cubic inch engines see specifications. Replace springs that do not meet specifications.

(2) Inspect each valve spring for squareness at both ends with a steel square and surface plate, as shown in Figure 19.

(3) If the spring is more than $\frac{1}{16}$ inch out of square, install a new spring.

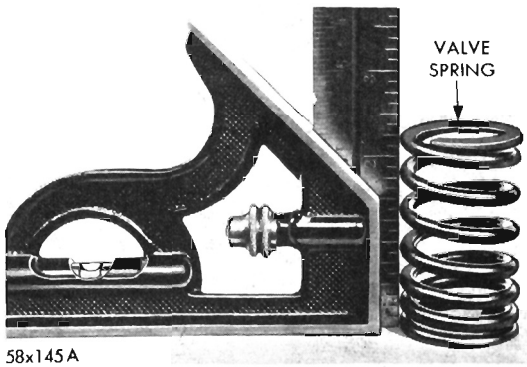


Fig. 19—Inspecting Valve Spring Squareness

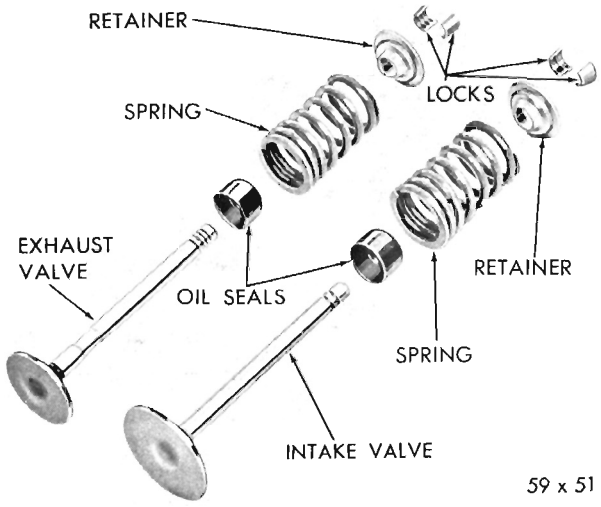


Fig. 20—Valve Assembly (Disassembled View)

Installation

(1) Coat the valve stems with lubricating oil and insert them in position in the cylinder head.

(2) Install new cup seals on the intake and exhaust valve stems and over valve guides, as shown in Figure 20 and 21 and install valve springs and retainers.

(3) Compress the valve springs with Tool C-3422A. Install locks and release tool.

NOTE: If the valves and/or seats are reground, measure the installed height of springs. Make sure measurement is taken from the bottom of the spring seat in cylinder head to the bottom surface of spring retainer. (If spacers are installed, measure from the top of spacer). If height is greater than $1\frac{11}{16}$ inches for 318 Cubic Inch Engine or $1\frac{67}{64}$ inches for 361, 383, 413 and 426 Cubic Inch Engines, install a $\frac{1}{16}$ inch spacer in head counterbore to bring spring height back to normal.

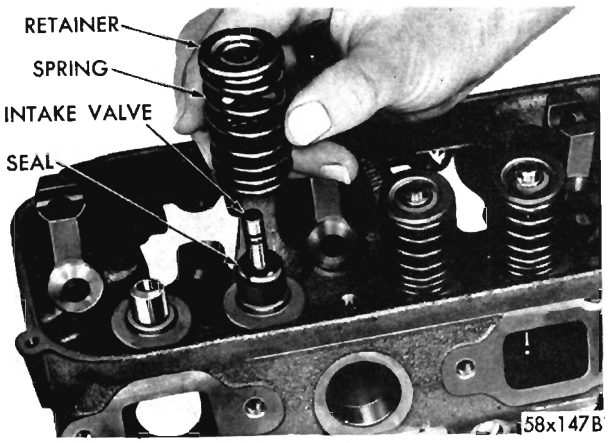


Fig. 21—Installing Valve and Cup Seals

8. HYDRAULIC TAPPETS (361, 383, 413 and 426 Cubic Inch Engines Only)

Preliminary to Hydraulic Tappets

(1) Before disassembling any part of the engine to correct tappet noise, check the oil pressure and the oil level in the oil pan. The pressure should be 45 to 65 pounds at 1000 RPM.

(2) The oil level in the pan should never be above "full" mark on the dipstick, or below the "add oil" mark. Either of these two conditions could be responsible for noisy tappets.

(3) **Oil Level too High**—If the oil level is above "full" mark on the dipstick, it is possible for the connecting rods to dip into oil while the engine is running and create foam. Foam in the oil pan would be fed to the hydraulic tappets by the oil pump causing them to go flat and allowing the valves to seat noisily.

(4) **Oil Level too Low**—Low oil level may allow the oil pump to take in air which, when fed to tappets, causes them to lose length and allows the valves to seat noisily. Any leaks on intake side of the pump through which air can be drawn will create the same tappet action. When tappet noise is due to aeration, it may be intermittent or constant, and usually more than one tappet will be noisy. When oil level and leaks have been corrected, the engine should be operated at fast idle for sufficient time to allow all of air inside of tappets to be bled out.

Tappet Noises

(1) To determine the source of tappet noise, operate the engine at idle with the cylinder head covers removed.

(2) Feel each valve spring or rocker arm to detect the noisy tappet. The noisy tappet will cause the affected spring and/or rocker arm to vibrate or feel rough in operation.

NOTE: Worn valve guides or cocked springs are sometimes mistaken for noisy tappets. If such is the case, noise may be dampened by applying side thrust on valve spring. Inspect rocker arm push rod sockets and push rod ends for wear. If noise is not appreciably reduced, it can be assumed the noise is in the tappet.

(3) Valve tappet noise ranges from a light noise to a heavy click. A light noise is usually caused by excessive leakdown around the unit plunger, (which will necessitate replacing tappet) or by the plunger partially sticking in the tappet body cylinder. A heavy

click is caused either by a tappet check valve not seating, or by foreign particles becoming wedged between the plunger and tappet body, causing plunger to stick in the down position. This heavy click will be accompanied by excessive clearance between the valve stem and the rocker arm as the valve closes. In either case, the tappet assembly should be removed for inspection and cleaning.

Removal of Tappets

(1) Tappets can be removed without removing the intake manifold or cylinder heads by following this recommended procedure: Remove the cylinder head covers.

(2) Remove the rocker arms and shaft assembly.

(3) Remove the push rods and place them in their respective holes in Tool C-3068.

(4) Slide the puller Tool C-3661 through the push rod opening in the cylinder head and seat tool firmly in the head of the tappet.

(5) Pull the tappet out of the bore with a twisting motion, as shown in Figure 22.

If all tappets are to be removed, remove the hydraulic tappets and place them in their repective holes in tappet and push rod holder, Tool C-3068. This will insure installation of the tappets in their original location. If there is a diamond shaped marking stamped on the engine numbering pad it indicates that all tappet bodies are .008 inch oversize. (See Fig. 23)

CAUTION: Do not disassemble a tappet on a dirty work bench. The plunger and tappet bodies are not interchangeable. The plunger and valve must always be fitted to the original body. It is advisable to work on one tappet at a time to avoid mixing of parts.

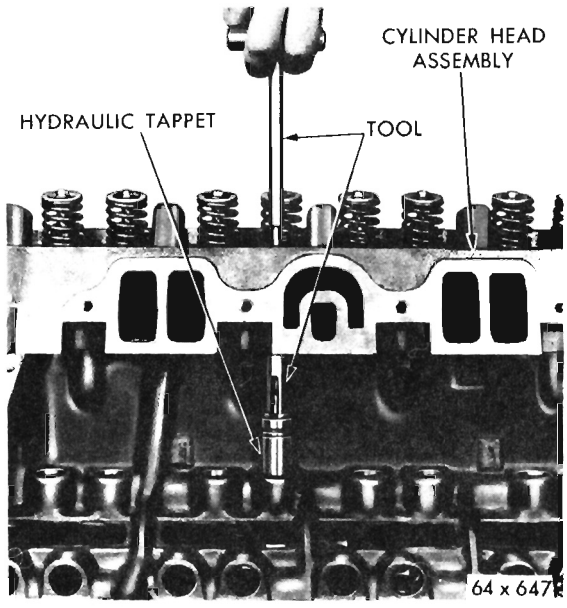


Fig. 22—Removing Tappet Using Tool C-3661

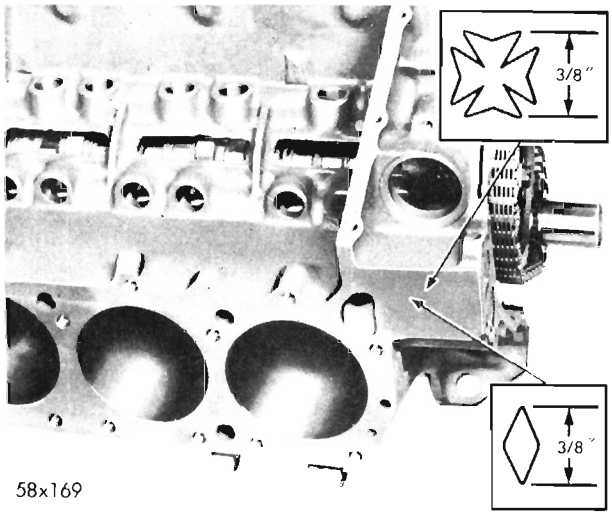


Fig. 23—Showing Location of External Numbering Pad (361, 383, 413 & 426 Cubic Engines)

Disassembly (Fig. 24)

(1) Pry out the plunger retainer spring clip.

(2) Clean the varnish deposits from the inside of tappet body above the plunger gap.

(3) Invert the tappet body and remove the plunger cap, plunger, flat check valve, check valve spring, check valve retainer and plunger spring.

(4) Separate the plunger, check valve retainer, check valve spring. Place all parts in their respective place in the tappet holder, Tool C-3068.

Cleaning and Assembly

(1) Clean all tappet parts in a solvent that will remove all varnish and carbon.

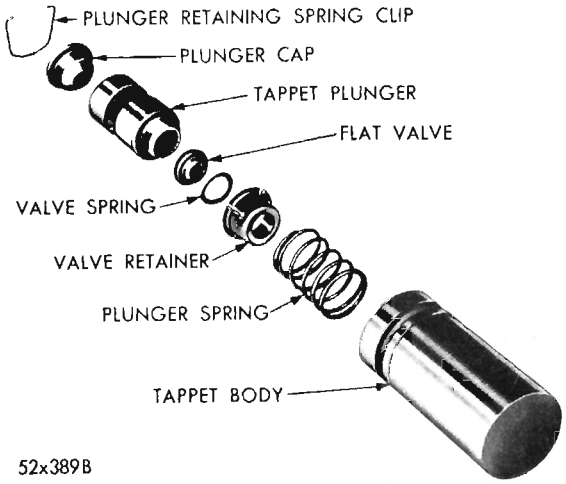


Fig. 24—Hydraulic Tappet Assembly (Disassembled View)

(2) Replace the tappets that are unfit for further service with new assemblies.

(3) Assemble the tappets, as shown in Figure 24.

Inspection

(1) If the tappet or bore in cylinder block is scored, scuffed, or shows signs of sticking, ream the bore to next oversize, using Tool C-3028.

(2) If plunger shows signs of scoring or wear and valve is pitted, or if valve seat on end of plunger indicates any condition that would prevent valve from seating, install a new tappet assembly.

Testing

(1) Fill a pan with clean kerosene.

(2) Remove the cap from the plunger and completely submerge the tappet in an upright position.

(3) Allow the tappet to fill with kerosene, remove the tappet, and replace the cap.

(4) Hold the tappet in an upright position and insert the lower jaw of pliers, Tool C-3160, in the groove of tappet body (Fig. 25).

(5) Engage the jaw of the pliers with the top of the tappet plunger. Test leakdown by compressing the pliers. If plunger collapses almost instantly as pressure is applied, disassemble the tappet, clean and test again.

(6) If the tappet still does not operate satisfactorily after cleaning, install a new tappet assembly.

Installation

(1) Lubricate the tappets.

(2) Install the tappets and push rods in their original positions.

(3) Install the rocker arm and shaft assembly.

(4) Start and operate the engine. To prevent damage to valve mechanism, the engine must not be run above fast idle until all of hydraulic tappets have filled with oil and have become quiet. Warm up to normal operating temperature.

9. TESTING THE VALVE TIMING (All Engines)

(1) Turn crankshaft until the No. 6 exhaust valve is closing and the No. 6 intake valve is opening.

(2) For 318 Cubic Inch Engine, Turn No. 1 intake valve adjusting screw in one complete turn. (Second valve on the left bank).

(3) 361, 383, 413 and 426 Cubic Inch Engines, Insert a ¼ inch spacer between the rocker arm pad and the stem tip of the No. 1 intake valve (second valve on the left bank). Allow the spring load to bleed the tappet down giving in effect a solid tappet.

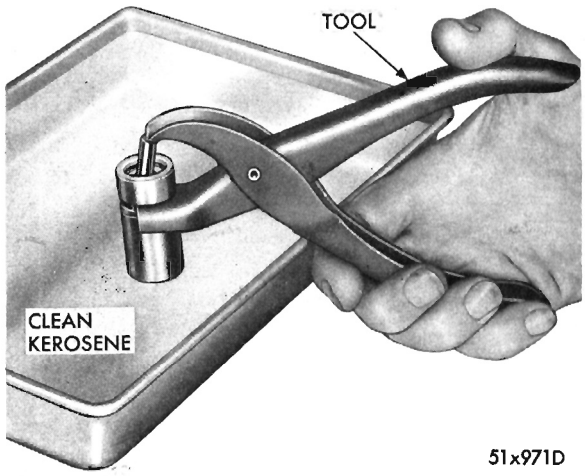


Fig. 25—Testing Tappet Using Tool C-3160

(4) Install a dial indicator so that the plunger contacts the valve spring retainer as nearly perpendicular as possible. Zero the indicator.

(5) Turn the crankshaft clockwise (normal running direction) until intake valve has lifted .041 inches for 318 Cubic Inch Engine or .013 inches for 361 and 383 Cubic Inch Engines with 2 BBL Carburetor or .034 for 361, 383, 413 and 426 Cubic Inch Engines with 4 BBL Carburetor.

The timing on the timing indicator, located on the chain cover, should read from 10 degrees BTDC to 2 degrees ATDC. If the reading is not within the specified limits: Inspect the timing sprocket index marks, inspect the timing chain for wear, and check the accuracy of the "O" mark on the timing indicator. Turn the crankshaft counter-clockwise until the valve is closed and remove the indicator and readjust lash (318 cubic Inch Engine) or remove spacer on the 361, 383, 413 and 426 Cubic Inch Engines.

CAUTION: Do not turn crankshaft any further clockwise as the valve spring might bottom and result in serious damage.

10. TIMING SPROCKETS AND CHAIN

Removal

(1) Drain the cooling system and remove the radiator and water pump assembly.

(2) Remove the bolt holding the vibration damper on the crankshaft.

(3) Remove two of the pulley bolts, install Tool C-3688 and pull the damper assembly off the end of crankshaft, as shown in Figure 26.

(4) On the 318 cubic inch engine remove the fuel line and fuel pump.

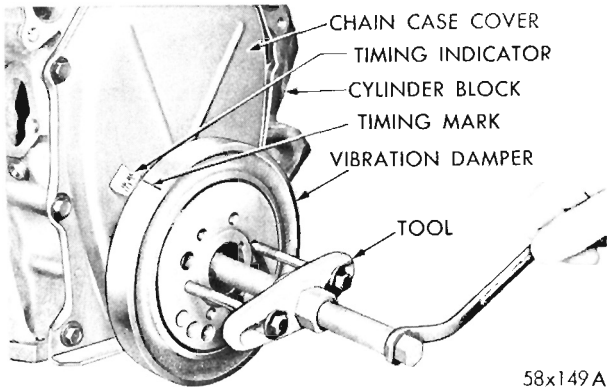


Fig. 26—Removing Vibration Damper Assembly Using Tool C-3688

(5) Remove the chain case cover and gasket, using extreme caution to avoid damaging the oil pan gasket. It is normal to find particles of neoprene collected between the crankshaft seal retainer and the crankshaft oil slinger.

(6) Slide the crankshaft oil slinger off the end of the crankshaft.

(7) Remove the camshaft sprocket attaching bolt.

(8) Remove the timing chain with the crankshaft and camshaft sprockets.

Installing Timing Chain

On 318 Cubic Inch Engine when installing the timing chain, use Tool C-3509 to prevent the camshaft from contacting the welch plug in the rear of the engine block. Remove the distributor and the oil pump-distributor drive gear. Locate tool against rear side of cam gear and attach the tool with distributor retainer plate bolt (Fig. 27). The tool should remain installed until the camshaft and crankshaft sprockets and timing chain have been installed.

On 361, 383, 413 and 426 Cubic Inch Engines

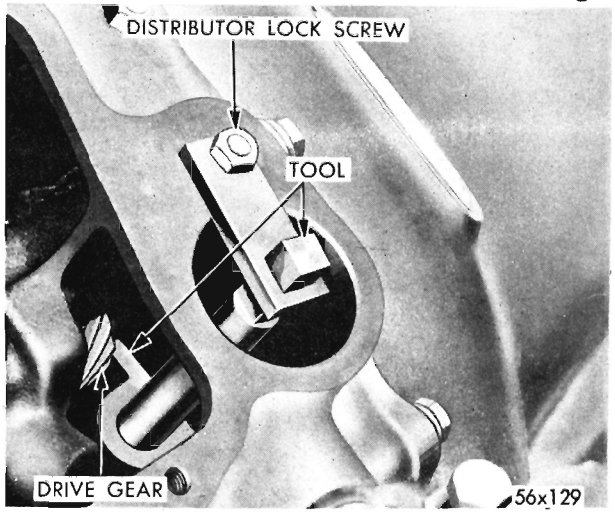


Fig. 27—Camshaft Holding Tool C-3509 (318 Cubic Inch)

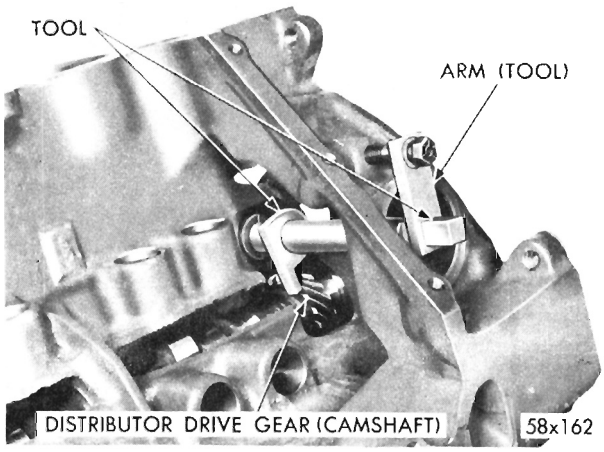


Fig. 28—Camshaft Holding Tool C-3509 (361, 383, 413 & 426 Cu. In.)

modify Tool C-3509 by grinding off the index lug holding upper arm on the tool and rotate arm 180°. Install Tool C-3509 in place of distributor drive gear and shaft, as shown in Figure 28, and attach the tool with the distributor retainer plate bolt.

(1) Place both the camshaft sprocket and crankshaft sprocket on the bench with timing marks on the exact imaginary center line through both camshaft and crankshaft bores.

(2) Place the timing chain around both sprockets.

(3) Turn the crankshaft and camshaft to line up with the keyway location in crankshaft sprocket and the dowel holes in the camshaft sprocket.

(4) Lift the sprockets and chain (keep sprockets tight against the chain in position as described).

(5) Slide both sprockets evenly over their respective shafts.

(6) Use a straightedge to check alignment of the timing marks (Fig. 29).

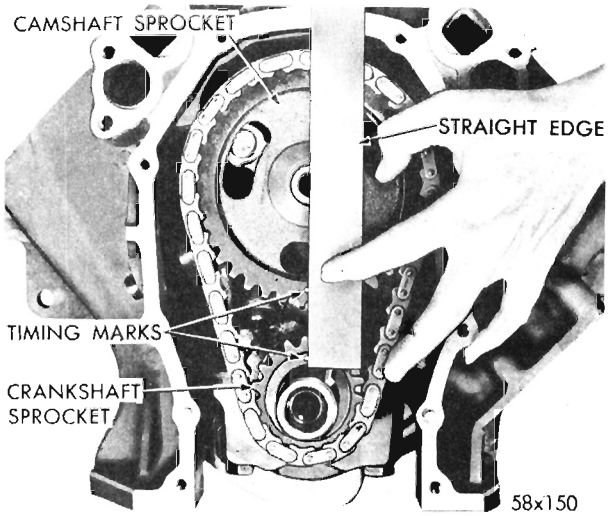


Fig. 29—Alignment of Timing Marks Using a Straight Edge (Typical)

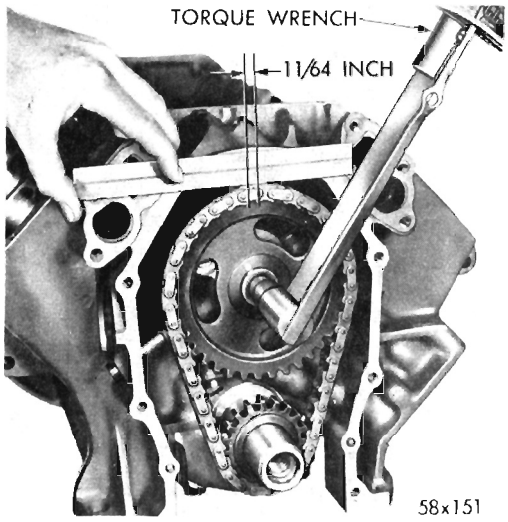


Fig. 30—Measuring Chain Stretch (Typical)

(7) Install the washer and camshaft sprocket bolt and tighten to 35 foot-pounds torque.

Testing Timing Chain for Stretch

(1) Place a scale next to the timing chain so that any movement of the chain may be measured.

(2) Place a torque wrench and socket over the camshaft sprocket attaching bolt and apply torque in the direction of crankshaft rotation to take up the slack; 30 foot-pounds torque (with cylinder head installed) or 15 foot-pounds torque (cylinder heads removed).

(3) Holding a scale with dimensional reading even with the edge of a chain link, apply torque in the reverse direction 30 foot-pounds (with cylinder heads installed) or 15 foot-pounds (cylinder heads removed), and note the amount of chain movement, as shown in Figure 30.

(4) Install a new timing chain, if its movement exceeds 3/16 inch for 318 Cubic Inch Engine and 11/64 inch for the 361, 383, 413 and 426 Cubic Inch Engines.

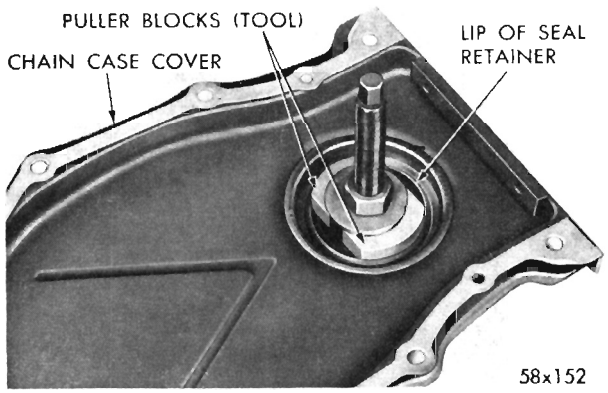


Fig. 31—Puller Blocks Expanded to Puller Position Tool C-3506

NOTE: With a torque applied to the camshaft sprocket bolt, the crankshaft should not be permitted to move. It may be necessary to block the crankshaft to prevent rotation.

(5) If the chain is satisfactory, slide the crankshaft oil slinger over shaft and up against the sprocket (flange away from sprocket).

11. TIMING CHAIN CASE COVER OIL SEAL REPLACEMENT

Removal

(1) Position the puller screw of Tool C-3506 through case cover, the inside of case cover up. Position the puller blocks directly opposite each other, and force the angular lip between neoprene and flange of the seal retainer.

(2) Place the washer and nut on puller screw. Tighten the nut as tight as possible by hand, forcing the blocks into the gap to a point of distorting the seal retainer lip (Fig. 31). This is important (puller is only poistioned at this point).

(3) Place the sleeve over the retainer and place removing and installing plate into sleeve.

(4) Place the flat washer and nut on puller screw. Hold the center screw and tighten the lock nut to remove the seal (Fig. 32).

Installation of Oil Seal

(1) Insert the puller screw through the removing and installing plate so that the thin shoulder will be facing up.

(2) Insert the puller screw with plate through the seal opening (inside of chain case cover facing up).

(3) Place the seal in the cover opening, with neoprene down. Place the seal installing plate into the new seal, with protective recess toward lip of seal retainer (Fig. 33).

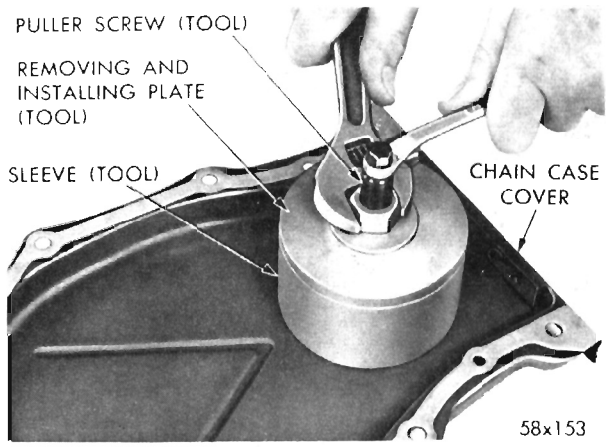


Fig. 32—Removing Oil Seal Tool C-3506

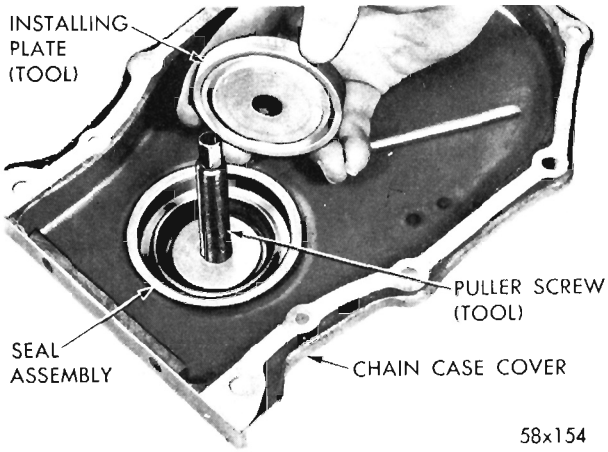


Fig. 33—Positioning Installer Plate on New Seal Tool C-3506

NOTE: Lip of the neoprene seal must be toward the source of oil.

(4) Install the flat washer and nut on puller screw, hold screw and tighten the nut (Fig. 34).

(5) The seal is properly installed when neoprene is tight against the face of the cover. Try to insert a .0015 feeler gauge between the neoprene and the cover (Fig. 35). If this seal is installed properly, the feeler gauge cannot be inserted. It is normal to find particles of neoprene collected between the seal retainer and crankshaft oil slinger after the seal has been in operation.

Installing Chain Case Cover

(1) Be sure the mating surfaces of the chain case cover and cylinder block are clean and free from burrs.

(2) Using a new gasket slide the chain case cover over the locating dowels and tighten bolts to 15 foot-pounds torque. Use extreme caution to avoid damaging the oil pan gasket.

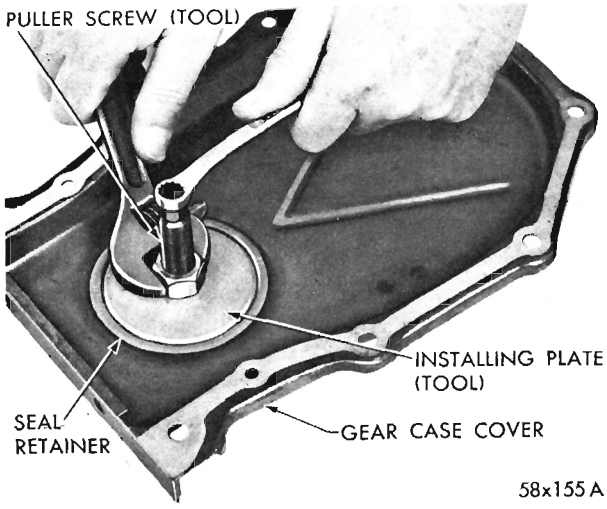


Fig. 34—Installing New Seal Tool C-3506

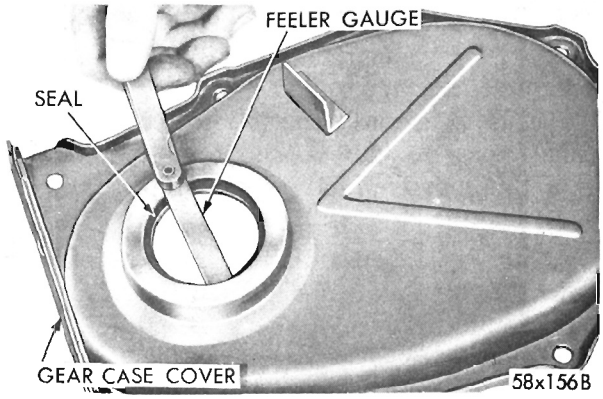


Fig. 35—Measuring Seal for Proper Seating

(3) On 318 Cubic Inch Engine, install the fuel pump lines.

(4) Install the water pump and housing assembly using new gaskets. Tighten bolts to 30 foot-pounds torque.

Installing Vibration Damper

(1) Install the hub on the crankshaft.

(2) Place the installing tool, part of puller set Tool C-3688 in position and press the damper hub on the crankshaft (Fig. 36).

(3) Slide the pulley over the shaft and attach with bolts and lockwashers.

(4) Tighten the bolts to 15 foot-pounds torque.

(5) Install damper hub retainer washer and bolt. Tighten to 135 foot-pounds torque.

(6) Install radiator, fan and belt, hoses and close the drains.

(7) Fill the cooling system.

12. CAMSHAFT

Removal

The camshaft thrust is forward with the 318 Cubic

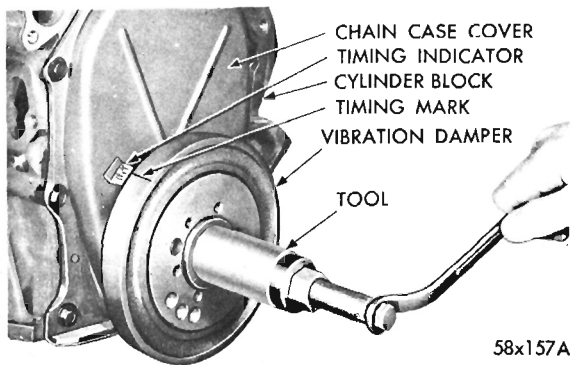


Fig. 36—Installing Vibration Damper Assembly (Tool C-3688)

Inch Engine, and a thrust plate is used to control the .002 to .006 inch end play. The 361, 383, 413 and 426 Cubic Inch Engines camshaft thrust is rearward only. Thrust is taken by the rear face of the cast iron camshaft sprocket hub, bearing directly on the front face of the cylinder block, eliminating the need for a thrust plate.

(1) With the tappets and timing sprockets removed, remove the distributor and lift out the oil pump and the distributor drive shaft.

(2) On 361, 383, 413 and 426 Cubic Inch Engines, remove the fuel pump to allow the push rod to drop away from the cam eccentric.

(3) Remove the camshaft being careful not to damage the cam bearings with the cam lobes.

Installation

(1) Lubricate the camshaft lobes and camshaft bearing journals and insert the camshaft to within ½ inch of its final position in the cylinder block.

(2) Install Tool C-3509 as described in paragraph "Timing Chain and Sprocket".

(3) Push the camshaft into the final position.

(4) Keep the tool in place until the sprockets and the chain have been installed. Complete installation as described in Paragraph "Timing Chain and Sprockets".

NOTE: Whenever and engine has been rebuilt and a new camshaft and/or new tappets have been installed, one quart of factory recommended oil additive should be added to the engine oil to aid in break-in. The oil mixture should be left in the engine for a minimum of 500 miles. Drain the oil mixture at the next normal oil change.

NOTE: Whenever the camshaft is replaced, all of the tappet faces must be inspected for crown with a straightedge. If any negative (crown dish) is observed, the tappet must be replaced.

13. CAMSHAFT BEARINGS (Engine Removed from Vehicle)

Removal

(1) With the engine completely disassembled, drive out the rear cam bearing welch plug.

(2) Install the proper size adapters and horse shoe washers (part of Tool C-3132A) at the back of each bearing shell to be removed and drive out the bearing shells.

Installation

(1) Install the new camshaft bearings with Tool C-3132A by sliding the new camshaft bearing shell over the proper adapter.

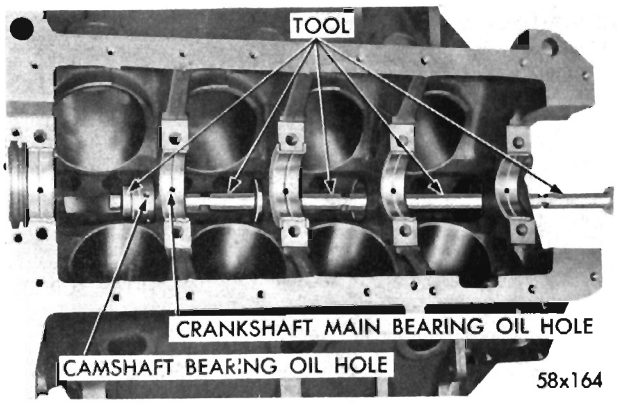


Fig. 37—Removing Camshaft Bearing Using Tool C-3132A

(2) Position the bearing in the tool. Install the horse shoe lock and by reversing the removal procedure, carefully drive bearing shell into place, as shown in Figure 37.

(3) Install the remaining shells in like manner.

NOTE: Install the No. 1 camshaft bearing 1/32" inward from the front face of the cylinder block.

The oil holes in the camshaft bearings and cylinder block must be in exact alignment to insure proper lubrication (Fig. 37).

Camshaft bearing index can be inspected after installation by inserting a pencil flashlight in the bearing shell. The camshaft bearing oil hole should be perfectly aligned with the drilled oil passage from the main bearing. Also the Number 4 bearing must index with the two oil passages to the cylinder heads. If the camshaft bearing shell oil holes are not in exact alignment, remove and reinstall them correctly. Apply MoPar Sealer to the plug and use Tool C-897 to install a new core hole plug at the rear of camshaft. Be sure this plug does not leak.

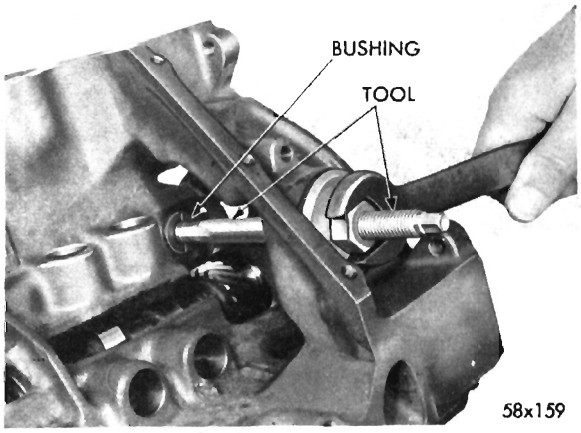


Fig. 38—Removing Distributor Drive Shaft Bushing Using Tool C-3052

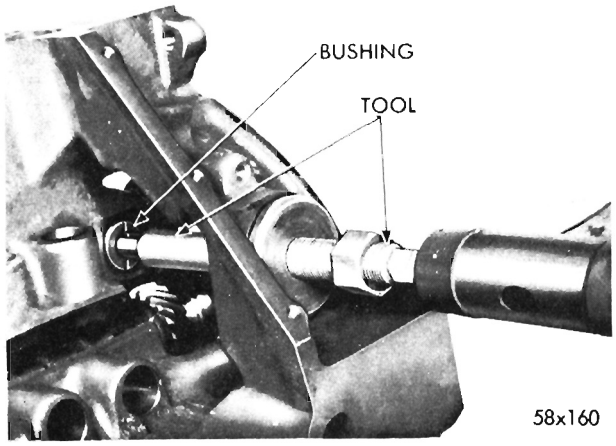


Fig. 39—Installing Distributor Drive Shaft Bushing Using Tool C-3053

14. DISTRIBUTOR DRIVE SHAFT BUSHING

Removal

(1) Insert Tool C-3052 into the old bushing and thread down until a tight fit is obtained (Fig. 38).

(2) Hold the puller screw and tighten puller nut until the bushing is removed.

Installation

(1) Slide a new bushing over the burnishing end of Tool C-3053 and insert the tool bushing into the bore, as shown in Figure 39.

(2) Drive the bushing and tool into position, using a soft hammer.

(3) As the burnisher is pulled through the bushing by tightening puller nut, the bushing is expanded tight in the block and burnished to correct size, as shown in Figure 40. **DO NOT REAM THIS BUSHING.**

Distributor Timing

Before installing the distributor and oil pump drive shaft, time the engine as follows:

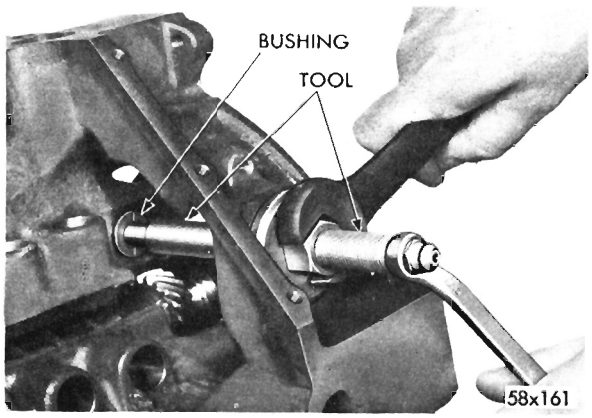


Fig. 40—Burnishing Distributor Drive Shaft Bushing Using Tool C-3053

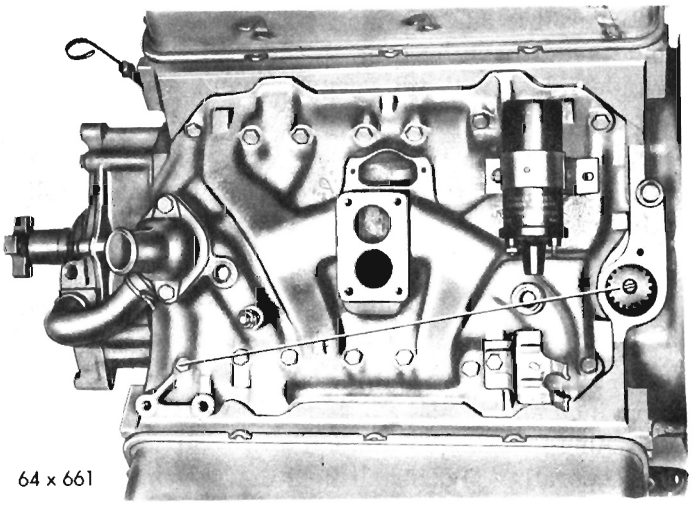


Fig. 41—Position of Distributor Drive Shaft (318 Cubic Inch)

(1) Rotate the crankshaft until the No. 1 cylinder is at top dead center on the firing stroke.

(2) When in this position, the straight line on the vibration damper should be under ("0") on the timing indicator.

(3) Coat the shaft and drive gear with engine oil. Install the distributor drive gear so when the gear spirals into place on the camshaft. The slot in the top of the distributor drive gear should be pointing to the first intake manifold bolt on the left side of engine (Fig. 41) for the 318 Cubic Inch Engine and parallel with the centerline of the crankshaft, as shown in (Fig. 42) for the 361, 383, 413 and 426 Cubic Inch Engines.

Installation of Distributor

(1) On 318 Cubic Inch Engine, hold the distributor over the mounting pad on the cylinder block with the vacuum chamber pointing to number 8 spark plug.

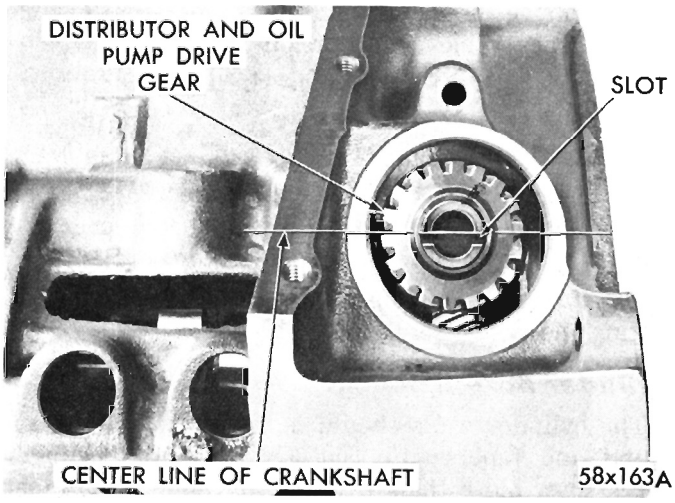


Fig. 42—Distributor Drive Gear Installed (361, 383, 413 & 426 Cu. In.)

(2) On 361, 383, 413 and 426 Cubic Inch Engines, hold the distributor over the mounting pad on the cylinder block with the vacuum chamber pointing toward the center of the engine.

(3) Turn the rotor until it points to the approximate location of the No. 1 tower terminal in the distributor cap.

(4) Place the distributor gasket in position.

(5) Lower the distributor and engage the shaft in the slot of the distributor drive shaft gear.

(6) Turn the distributor counter-clockwise for 318 cubic inch engine and clockwise for 361, 383, 413 and 426 cubic inch engine until the breaker contacts are just separating and install hold down clamp.

15. CYLINDER BLOCK

Cleaning and Inspection

(1) With the engine in repair stand C-3167 and the cylinder heads, oil pan and timing chain removed clean the cylinder block thoroughly. Inspect all core plugs for evidence of leaking.

(2) If new core plugs are installed coat the edges of the plug and core hole with MoPar Sealer and drive the plugs in place with a suitable driver.

(3) Examine the block for cracks or fractures.

(4) Remove the top ridge of the cylinder bores with a reliable ridge reamer before removing the pistons from the cylinder block. Be sure to keep the tops of the pistons covered during this operation.

NOTE: Pistons and connecting rods must be removed from the top of the cylinder block. When removing the piston and connecting rod assemblies from the engine, rotate crankshaft so each connecting rod is centered in the cylinder bore.

(5) Remove the oil strainer and tube. On 318 Cubic Inch Engines, remove with the oil pump.

(6) Mark all bearing caps as necessary for proper location.

(7) Remove the connecting rod cap.

(8) Install Tool C-3221 on one connecting rod bolt and protector over the other bolt and push each piston and rod assembly out of the cylinder bore.

(9) After removal, install the bearing cap on the mating rod.

Cylinder Bore Inspection

The cylinder walls should be measured for out-of-round and taper with Tool C-119. If the cylinder bores show more than .005" out-of-round, or a taper of more than .010" or if the cylinder walls are badly scuffed or scored, the cylinder block should be rebored and honed, and new pistons and rings fitted. Whatever type of boring equipment is used, boring and honing operation should be closely coordinated with the fitting of pistons and rings in order that specified clearances may be maintained.

Honing Cylinder Bores

Before honing, stuff plenty of clean rags under the bores, over the crankshaft to keep the abrasive materials from entering the crankcase area.

(1) Use carefully, the cylinder bore resizing hone Tool C-823, equipped with 220 grit stones, is the best tool for this job. In addition to deglazing, it will reduce taper and out-of-round as well as removing light scuffing, scoring or scratches. Usually a few strokes will clean up a bore and maintain the required limits

(2) Deglazing of the cylinder walls may be done using a cylinder surfacing hone, Tool C-3501, equipped with 280 grit stones (Tool C-3501-3810). If the cylinder bore is straight and round, 20-60 strokes depending on the bore condition will be sufficient to provide a satisfactory surface. Inspect cylinder walls after each 20 strokes. Use honing oil C-3501-3880 or a light honing oil available from major oil distributors. Do not use engine or transmission oil, mineral spirits or kerosene.

(3) Honing should be done by moving the hone up and down fast enough to get a cross-hatch pattern. When hone marks intersect at 60°, the cross hatch angle is most satisfactory for proper seating of rings (See Figure 43).



Fig. 43—Cross Hatch Pattern

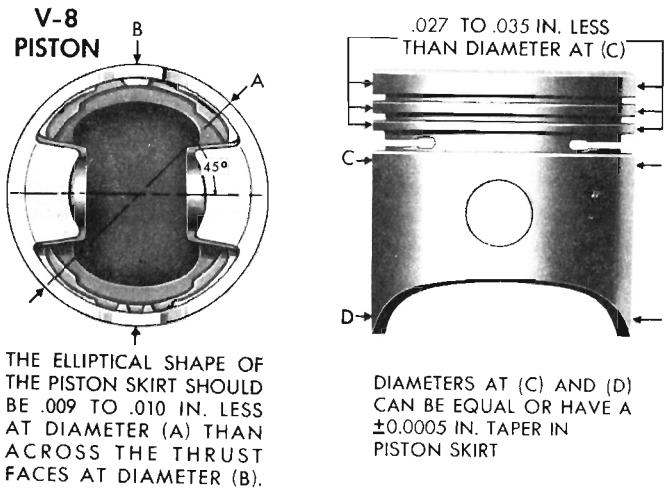


Fig. 44—Piston Measurements (318 Cubic Inch)

(4) After honing, it is necessary that the block be cleaned again to remove all traces of abrasives.

CAUTION: Be sure all abrasives are removed from engine parts after honing. It is recommended that a solution of soap and water be used with a brush and the parts then thoroughly dried. The bore can be considered clean when it can be wiped clean with a white cloth and cloth remains clean. Oil bores after cleaning to prevent rusting.

16. PISTON AND RINGS

The pistons are cam ground so that the diameter at the pin boss is less than its diameter across the thrust face. This allows for expansion under normal operating conditions. Under operating temperatures, expansion forces the pin bosses away from each other, thus, causing the piston to assume a more nearly round shape. It is important that pistons be checked for taper and elliptical shape before they are fitted into the cylinder bore (See Figs. 44 and 45).

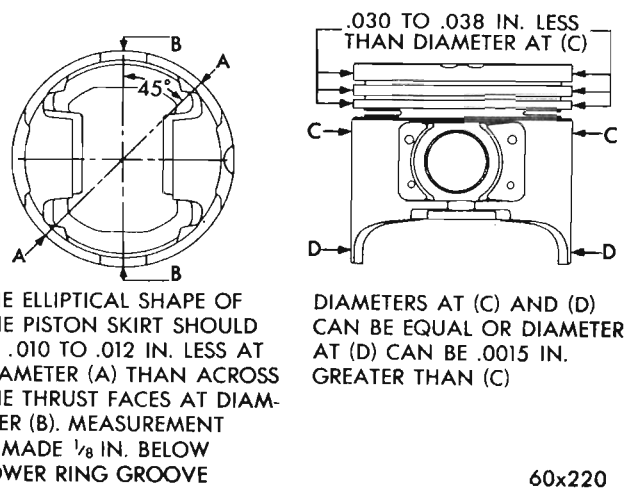


Fig. 45—Piston Measurements (361, 383, 413 & 426 Cubic Inch)

Finished Pistons

All pistons are machined to the same weight in grams, regardless of oversize to maintain piston balance. For cylinder bores which have been honed or rebored, pistons are available in standard and the following oversizes: .005, .020, .040 inch.

318 Cubic Inch Engine Fitting Pistons

Piston fitting should be done at normal room temperature, 70°. Use a spring scale and a strip of ½ inch wide feeler stock .0015 inch thickness. The feeler stock should be long enough to extend into the cylinder bore to the full length of the piston travel. **The cylinder bore and piston must be clean.**

(1) Coat the cylinder bore lightly with SAE 10W engine oil. Insert the piston in the bore upside down with the feeler stock between the thrust face of the piston and the cylinder wall.

(2) Hold the piston and draw the feeler stock straight out, with the spring scale Tool C-690 as shown in Figure 46. The amount of pull required should be from 5 to 10 pounds.

361, 383, 413 & 426 Cubic Inch Engines Fitting Pistons

The piston and cylinder wall must be clean and dry. The specified clearance between the piston at the top of the skirt and the cylinder wall is .0003 to .0013 inch.

The piston diameter should be measured at the top of the skirt 90° to the piston pin axis. The cylinder bores on used engines should be measured halfway down the cylinder bore and 90° to the engine crank-

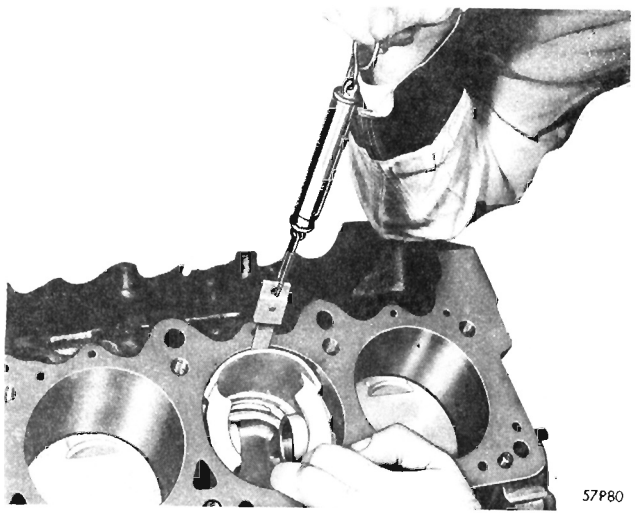


Fig. 46—Filling Piston In Cylinder Bore

shaft center line. **Pistons and cylinder bores should be measured at normal room temperature 70° F.**

All service pistons include the pin, and are available in standard and the following oversizes: .005, .020, and .040 inch.

Piston Rings

(1) Measure the piston ring gap about 2 inches from the bottom of the cylinder bore in which it is to be used. (An inverted piston can be used to push the rings down into position. This will insure the rings being exactly square with the cylinder wall before measuring).

(2) Insert the feeler stock in the gap. For 318 Cubic Inch Engine, the ring gap should be from .010 inch to .047 inch for the compression rings and .015 inch to .062 inch for the oil ring steel rails in standard size bores (for new service rings). For 361, 383, 413 and 426 Cubic Inch Engines, the ring gap should be between .013 to .052 inch for the compression rings and .015 to .062 inch for the oil ring steel rails in standard size bores (for new service rings). All engines, maximum gap in .005 inch O/S bores should be .060 inch for compression rings and .070 inch for oil ring steel rails.

(3) Measure the side clearance between piston ring and ring land. The clearance should be .0015 to .003 inch for the top compression ring and the intermediate ring, and .001 to .009 for the oil control ring. (For new service rings.) (Fig. 47.)

(4) Install the oil ring in the lower ring groove using the instructions in the service ring package.

(5) Install the compression rings in the middle and top grooves with side marked "TOP" up; use ring installer Tool C-3586 for the 318 Cubic Inch Engine, Tool C-3628 for the 361 Cubic Inch Engine, Tool C-3673 for the 383 and 426 Cubic Inch Engines, Tool C-3671 for the 413 Cubic Inch Engine.

Piston Pin (318 Cubic Inch Engine)

Removal

(1) Mark all pistons and connecting rods as necessary for proper location.

(2) Remove piston pin lock rings and press out piston pins.

Fitting Piston Pins

(1) The piston pin fit in the connecting rod and piston should be a tight thumb push fit at normal room temperature, 70 degrees F.

(2) If there is excessive clearance between the piston pin and piston, ream piston and connecting rod to next oversize. Piston pins are available in standard, .003, .008 inch oversize.

(3) If there is excessive clearance between the piston pin and connecting rod, replace the connecting rod bushing and fit the bushing to the piston pin.

(4) New pistons are supplied with fitted pins.

Installation of Piston Pin

(1) Assemble pistons and rods for the left hand cylinder bank (1-3-5-7) with piston boss marked "Front" and indent on piston head on the same side as the large chamfer on large end of connecting rod. Assemble pistons and rods to be used in the right cylinder bank (2-4-6-8) with "Front" and indent opposite the large chamfer in the connecting rod.

17. PISTON PINS (361, 383, 413 & 426 Cubic Inch Engines)

Removal

(1) Arrange Tool C-3684 parts for the removal of piston pin, as shown in Figure 48.

(2) Install the pilot on the main screw.

(3) Install the screw through the piston pin.

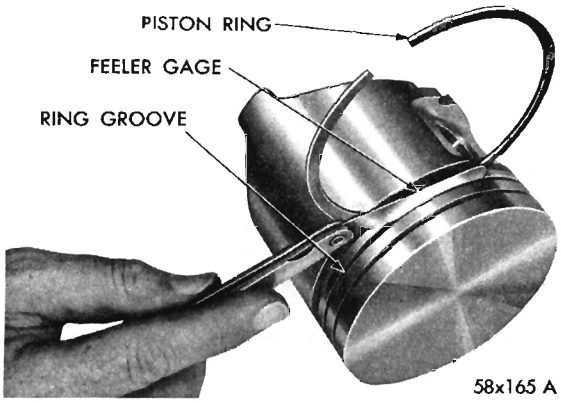


Fig. 47—Measuring Piston Ring Clearance

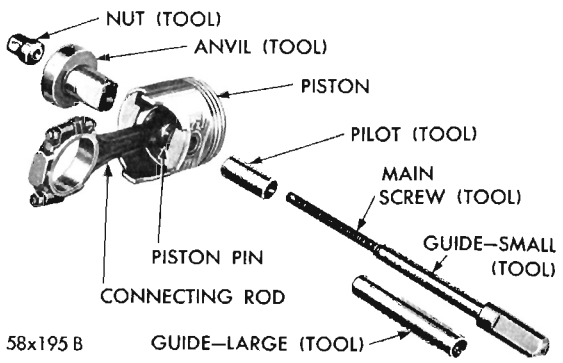


Fig. 48—Removing Piston Pin Using Tool C-3684

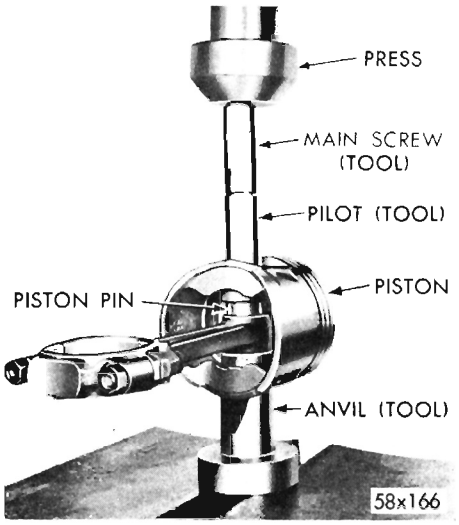


Fig. 49—Removing Piston Pin from Connecting Rod Tool C-3684

(4) Install the anvil over the threaded end of the main screw with the small end of the anvil against the piston boss.

NOTE: Be sure spring is removed from anvil.

(5) Install nut loosely on the main screw and place the assembly on a press, as shown in Figure 49.

(6) Press the piston pin out of the connecting rod.

NOTE: When the pin falls free from the connecting rod, stop the press to prevent damage to the bottom of the anvil.

(7) Remove the tool from the piston.

Installation

(1) Test the piston pin fit in the piston. It should be a sliding fit in the piston at 70°F. Piston pins are supplied in standard sizes only.

(2) Lubricate the piston pin holes in the piston and connecting rod.

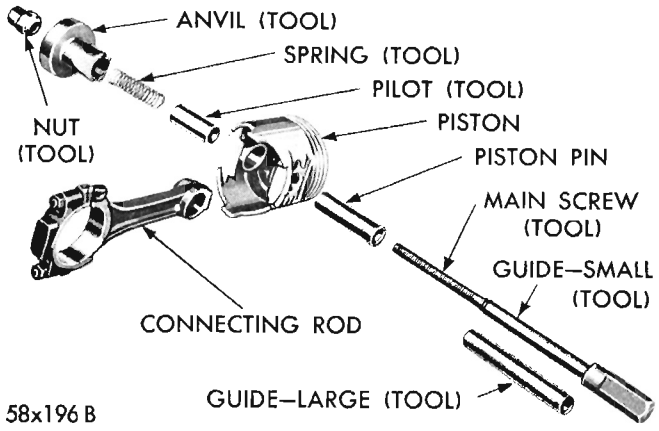


Fig. 50—Tool Arrangement for Installing Piston Pin Tool C-3684

(3) Arrange the tool parts for installation of piston pin, as shown in Figure 50.

(4) Install the spring inside the pilot and install the spring and pilot in the anvil. Install the piston pin over the main screw.

(5) Place the piston, with "front" up, over the pilot so that the pilot extends through the piston pin hole.

(6) Position the connection rod over the pilot which extends through the piston hole.

NOTE: Assemble rods to pistons of the right cylinder bank (2, 4, 6 and 8) with the indent on the piston head opposite to the large chamfer on the large bore end of connecting rod. Assemble the rods to pistons of the left cylinder bank (1, 3, 5 and 7) with the indent on the piston head on the same side as the large chamfer on the large bore end of connecting rod.

(7) Install the main screw and piston pin in the piston, as shown in Figure 51.

(8) Install the nut on puller screw to hold assembly together. Place assembly on a press, as shown in Figure 51.

(9) Press in the piston pin until the piston pin bottoms on the pilot properly positioning the pin in the connecting rod.

(10) Remove the tool and arrange tool parts and piston assembly in the same manner, as shown in Figure 48.

(11) Place the assembly in a vise, as shown in Figure 52.

(12) Attach the torque wrench to nut and test torque up to 15 foot-pounds torque. If the connecting rod moves downward on piston pin, reject this con-

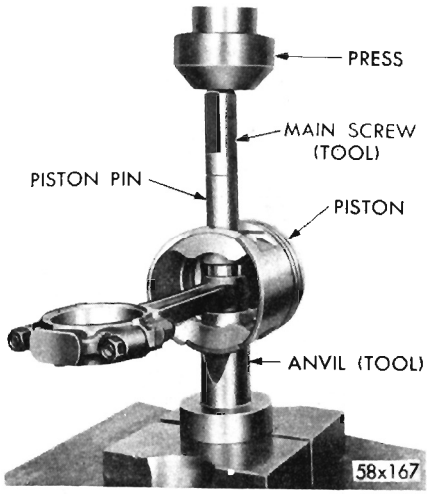


Fig. 51—Installing Piston Pin

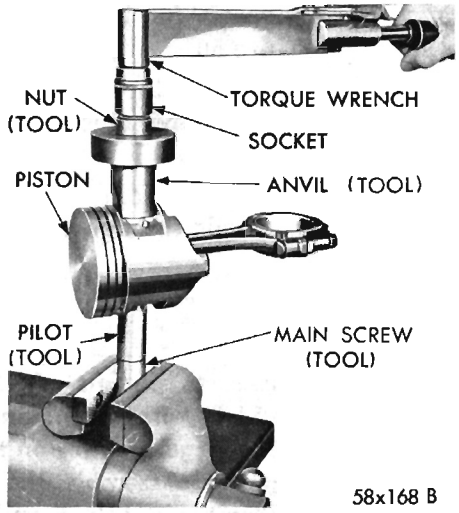


Fig. 52—Testing Fit of Piston Pin in Connecting Rod Tool C-3684

necting rod and piston combination. Obtain a connecting rod with proper small end bore diameter and repeat the installation and checking procedure.

(13) If the connecting rod does not move under 15 foot-pounds torque, the piston pin and connecting rod interference is satisfactory, the tool may be removed.

18. CONNECTING ROD—IDENTIFICATION

A Maltese Cross stamped on the engine numbering pad (Fig. 53) indicates that the engine is equipped with a crankshaft which has one or more connecting rods and main bearing journals finished .001 inch undersize. However on 318 cubic inch engine with a B following engine serial number and/or on 361, 383, 413 and 426 cubic inch engines with a "X" following a maltese cross indicates that all main journals and/or all rod journals are .010 inch undersize. The position of the undersize journal or journals will be stamped on the machined surface of No. 3 counterweight (Fig. 54).

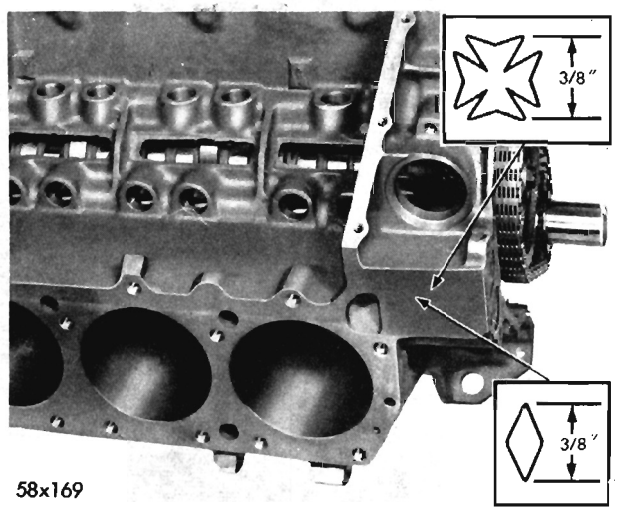


Fig. 53—Showing Location of External Engine Numbering Pad

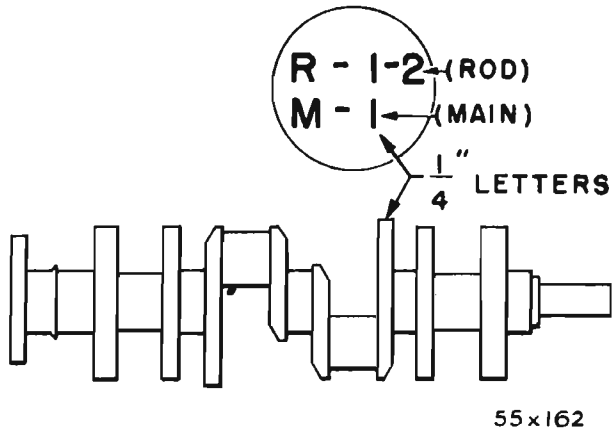


Fig. 54—Showing Location of Internal Marking of No. 3 Counterweight

Connecting rod journals will be identified by the letter "R" and main bearing journals by the letter "M". For example "M-1" indicates that No. 1 main bearing is .001 inch undersize.

19. CONNECTING ROD BEARINGS

Installation

NOTE: Fit all rods on one bank until completed. Do not alternate from one bank to another, because when the rods are assembled to pistons correctly, they are not interchangeable from one bank to another.

Connecting rod bearings caps have a small "V" groove across the parting face. When installing a lower bearing, the "V" groove of the bearing must be placed on the "V" groove side of the cap. This provides lubrication of the cylinder wall in the opposite bank. Also, the tangs in the steel back must be placed in the grooves in the rods and caps. The connecting rod side play for the 318 Cubic Inch Engine should be .006 to .014 inch (two rods) and .009 to .017 inch for the 361, 383, 413 and 426 Cubic Inch Engines.

The limits of taper or out-of-round on any crankshaft journals should be held to .001 inch. Bearings are available in .001, .002, .003, .010 and .012 inch undersize. Install the bearings in pairs. Do not use a new bearing half with an old bearing half. Do not file the rods or bearing caps.

20. MEASURING CONNECTING ROD BEARING CLEARANCE

Shim Stock Method

(1) Place an oiled .001 inch feeler stock (½ inch wide and ¾ inch long) between bearing and connecting rod journal.

(2) Install bearing cap and tighten to 45 foot-pounds torque.

(3) Turn the connecting rod ¼ turn in each direction. A slight drag should be felt which indicates clearance is satisfactory. The correct clearance is from .0005 to .0015 inch.

(4) The side play for the 318 Cubic Inch Engine should be .006 to .014 inch (two rods) and .009 to .017 inch for 361, 383, 413 and 426 Cubic Inch Engines.

21. PISTON AND CONNECTING ROD ASSEMBLY

Installation

(1) Before installing the pistons, rods, and rod assemblies in the bore, be sure that compression ring gaps are staggered so that neither are in line with the oil ring rail gaps.

(2) The oil ring expander ends should be positioned toward the outside of the "V" of the engine. The oil ring rail gaps should be positioned opposite each other and above the position pin holes.

(3) Immerse the piston head and rings in clean engine oil, slide the ring compressor, Tool C-385, over the piston and tighten with the special wrench (part of Tool C-385).

(4) Be sure the position of the rings does not change during this operation. Screw the connecting rod bolt protector (part of Tool C-3221) on one rod bolt, and insert the rod and piston into cylinder bore.

NOTE: Rotate the crankshaft so that the connecting rod journal is on center of the cylinder bore.

(5) Attach the puller part of Tool C-3321 on the other bolt, and guide the rod over the crankshaft journal, as shown in Figure 55.

(6) Tap the piston down in the cylinder bore, using the handle of a hammer. At the same time, guide the connecting rod into position on the crankshaft journal.

(7) The notch or groove on the top of the piston must be pointing toward front of the engine and the larger chamfer of the connecting rod bore must be installed toward the crankshaft journal fillet.

(8) Install the rod caps, and tighten nuts to 45 foot-pounds torque.

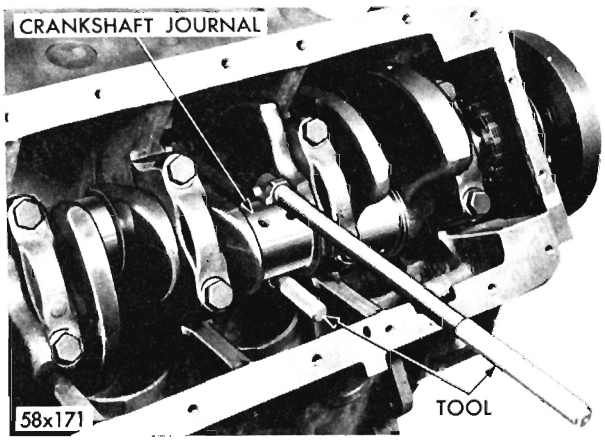


Fig. 55—Removing or Installing Connecting Rod Using Tool C-3221

22. CRANKSHAFT MAIN JOURNALS

The crankshaft journals should be inspected for excessive wear, taper and scoring. Journal grinding should not exceed .012 inch under the standard journal diameter. DO NOT grind the thrust faces of No. 3 main bearing. DO NOT nick the crankpin or main bearing fillets. After regrinding, remove the rough edges from the crankshaft oil holes and clean out all the oil passages.

23. CRANKSHAFT MAIN BEARINGS

The upper main bearings are not interchangeable with the lower main bearings. On 318 cubic inch engines (Fig. 56), bearing numbers 1, 2 and 4 are interchangeable as complete bearings. On 361, 383, 413 and 426 cubic inch engines (Fig. 57), bearings 2, 4 and 5 are interchangeable as complete bearings. The No. 1 upper main bearing is not interchangeable and is chamfered on the tab side for timing chain oiling and can be identified by a red marking on the edge of the bearing.

On both engines, number 3 bearing halves are flanged to carry the thrust load and are not interchangeable with the other four bearings. Bearings that are not badly worn or pitted must be reinstalled in the same position.

The bearing caps are not interchangeable and should be marked at removal to insure the correct assembly. Bearing shells are available in standard and

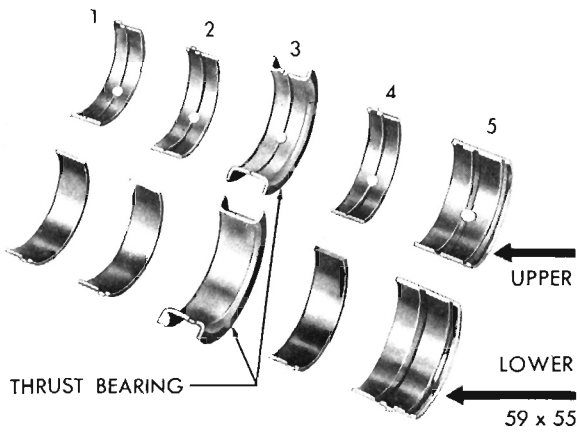


Fig. 56—Main Bearing Identification (318 Cubic Inch)

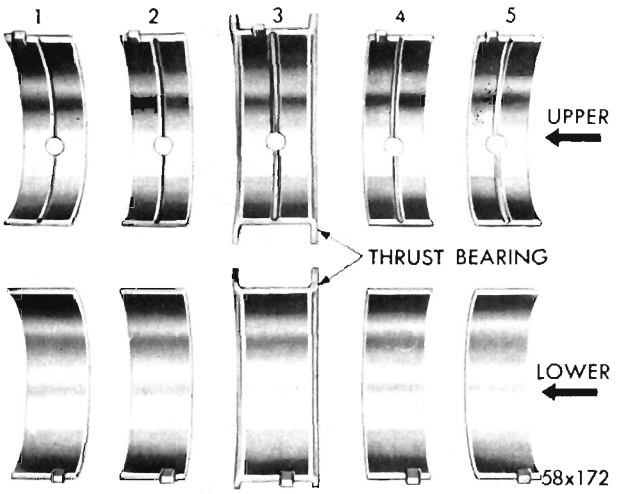


Fig. 57—Main Bearing Identification (361, 383, 413 & 426 Cubic Inch)

the following undersizes: .001, .002, .003, .010 and .012 inch. Never install an undersize bearing shell that will reduce the clearance below specifications.

Removal

(1) Remove the oil pan and mark the bearing caps before removal.

(2) Remove the bearing caps one at a time. Remove the upper half of the bearing by inserting Tool C-3059 (Fig. 58) into the oil hole of the crankshaft.

(3) Slowly rotate the crankshaft clockwise, forcing out the upper half of bearing shell.

Measuring Main Bearing Clearance (Shim Stock Method)

(1) Smooth the edges of a ½ x ¾ inch piece of soft copper or brass shim stock, .001 inch thickness.

(2) Lubricate the main bearing journals and position the shim stock across the center main journal.

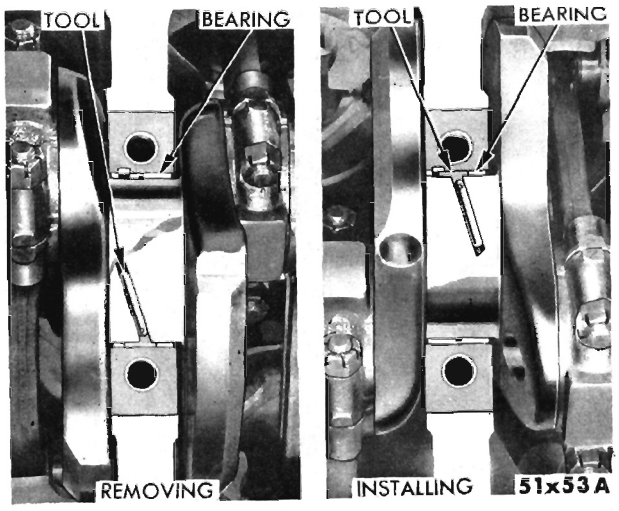


Fig. 58—Removing or Installing Main Bearing (Tool C-3059)

(3) Install the bearing in the center main bearing cap, bearing tank in groove in cap, lubricate bearing and seat cap or block. Tighten bolts to 85 foot-pounds torque.

(4) If a slight drag is felt as the crankshaft is turned (move no more than ¼ turn in either direction), the clearance is .001 inch or less and is considered satisfactory.

If, however, no drag is felt, the bearing is too large or the crankshaft cannot be rotated, the bearing is too small and should be replaced with the correct size.

(5) Measure crankshaft end play to .002-.007 inch. If end play is less than .002" or more than .007", install a new Number 3 main bearing.

(6) Fit the remaining bearings in same manner.

Only one main bearing should be selectively fitted while all other main bearing caps are properly torqued.

It is permissible to use one .001 inch undersize bearing shell with one standard bearing shell or one .002 inch bearing shell. **Always use the smaller diameter bearing half as the upper.** Never use a new bearing with a used bearing and never use an upper bearing half more than .001 inch smaller than the lower bearing half.

Installation of the Upper Main Bearing

NOTE: When installing a new upper bearing shell, slightly chamfer the sharp edges from the plain side.

(1) Start bearing in place, and insert Tool C-3059 into the oil hole of the crankshaft (Fig. 58).

(2) Slowly rotate the crankshaft counter-clockwise sliding the bearing into position.

(3) After all bearings have been fitted, tighten all caps to 85 foot-pounds torque. The crankshaft end play should be .002 to .007 inch.

24. REPLACEMENT OF THE REAR MAIN BEARING OIL SEALS (Crankshaft Removed)

Upper Seal

(1) Install a new rear bearing oil seal in the cylinder block so that both ends protrude.

(2) Use Tool C-3511 for 318 cubic inch engine and Tool C-3625 for 361 and 383 cubic inch engine or Tool C-3743 for 413 and 426 cubic inch engine with bridge removed, tap the seal down into position until the tool is seated in the bearing bore.

(3) Hold the tool in this position and cut off the portion of the seal that extends above the block on both sides.

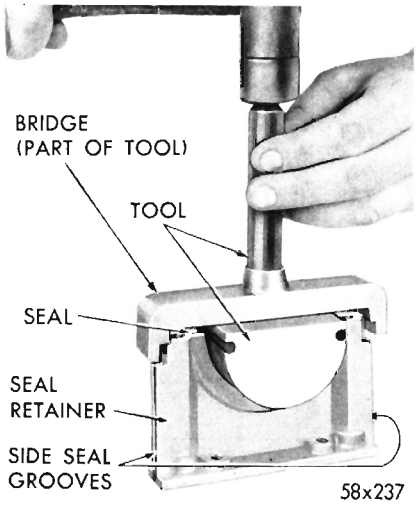


Fig. 59—Installing Rear Main Bearing Lower Oil Seal

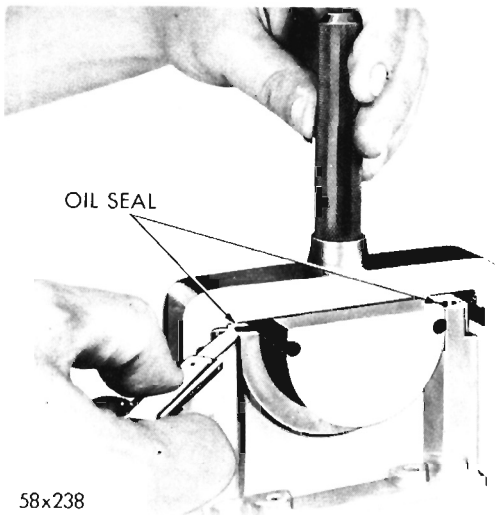


Fig. 60—Trimming Rear Main Bearing Lower Oil Seal

Lower Seal 318 Cubic Inch Engine

(1) Install a new rear main bearing oil seal in the cap with Tool C-3511.

(2) Hold the tool in this position and cut off the ends of seal flush with cap.

(3) Install the bearing shell and cap seals with the bearing cap and tighten to 85 foot-pounds torque.

361, 383, 413 & 426 Cubic Inch Engines

(1) Install a new seal in the seal retainer so that the ends protrude. Figure 59.

(2) Install the bridge on Tool C-3625 for 361 and 383 cubic inch engine or Tool C-3743 for 413 and 426 cubic inch engine, tap the seal down into position until the tool is seated.

(3) Trim off the portion of the seal that protrudes from the cap. Figure 60.

Side Seals

Seals are cut to proper length. Under no circumstances should these seals be cut off. Perform the following operation as rapidly as possible. These side seals are made from a material that expands quickly when oiled. A slight oil leak may be encountered when starting the engine if sufficient time has not elapsed to adequately expand the seals.

(1) Apply mineral spirits or diesel fuel to side seals.

(2) Install seal immediately in seal retainer grooves.

(3) Install seal retainer and tighten screws to 30 foot-pounds torque.

NOTE: Failure to pre-oil seals will result in oil leak.

ENGINE OILING SYSTEM

25. OIL PAN

Removal

(1) Disconnect the negative (ground) cable from the battery, and remove the dipstick.

(2) Raise the vehicle on a hoist, drain the oil. On 318 cubic inch engines; remove the engine to torque converter housing brace.

(3) Remove the steering and idle arm ball joints from the steering linkage center link.

(4) Remove the exhaust cross-over pipe from the exhaust manifolds and leave it hang without disconnecting it from the muffler.

(5) Remove the oil pan bolts and the oil pan.

Installation

(1) Inspect the alignment of the oil strainer. The bottom of the strainer must be parallel with the machined surface of the cylinder block. The bottom of the strainer must touch the bottom of the oil pan.

(2) Install the oil pan using a new gasket and seals on 318 cubic inch engine, and install the engine to converter housing brace.

(3) Connect the exhaust cross-over pipe to manifolds. (If so equipped.)

(4) Connect the steering and idler arm ball joints to the steering linkage center link.

(5) Lower the vehicle, install the dipstick, fill with the proper grade and quantity of motor oil, connect battery ground.

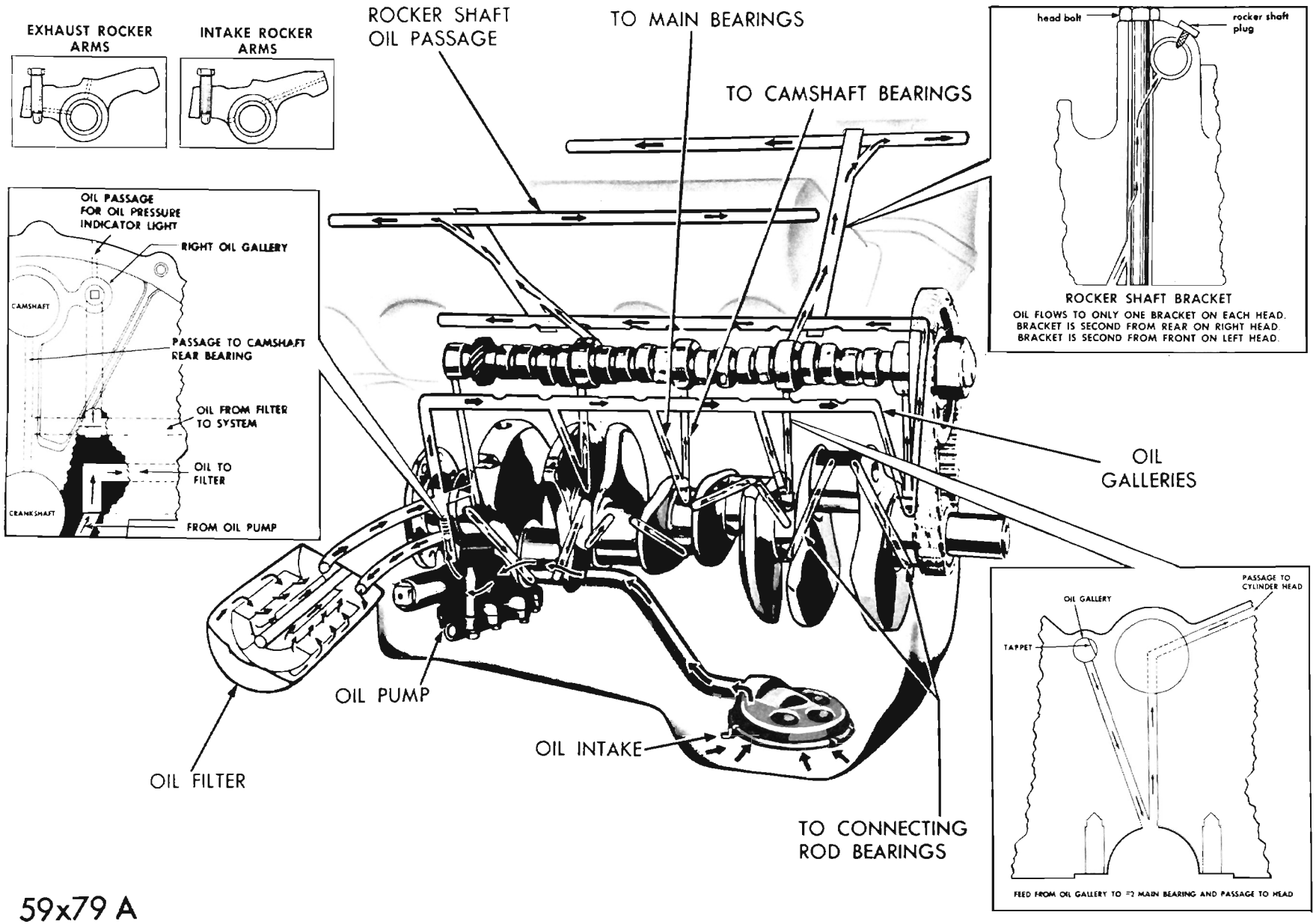


Fig. 61—Engine Oiling System (318 Cubic Inch)

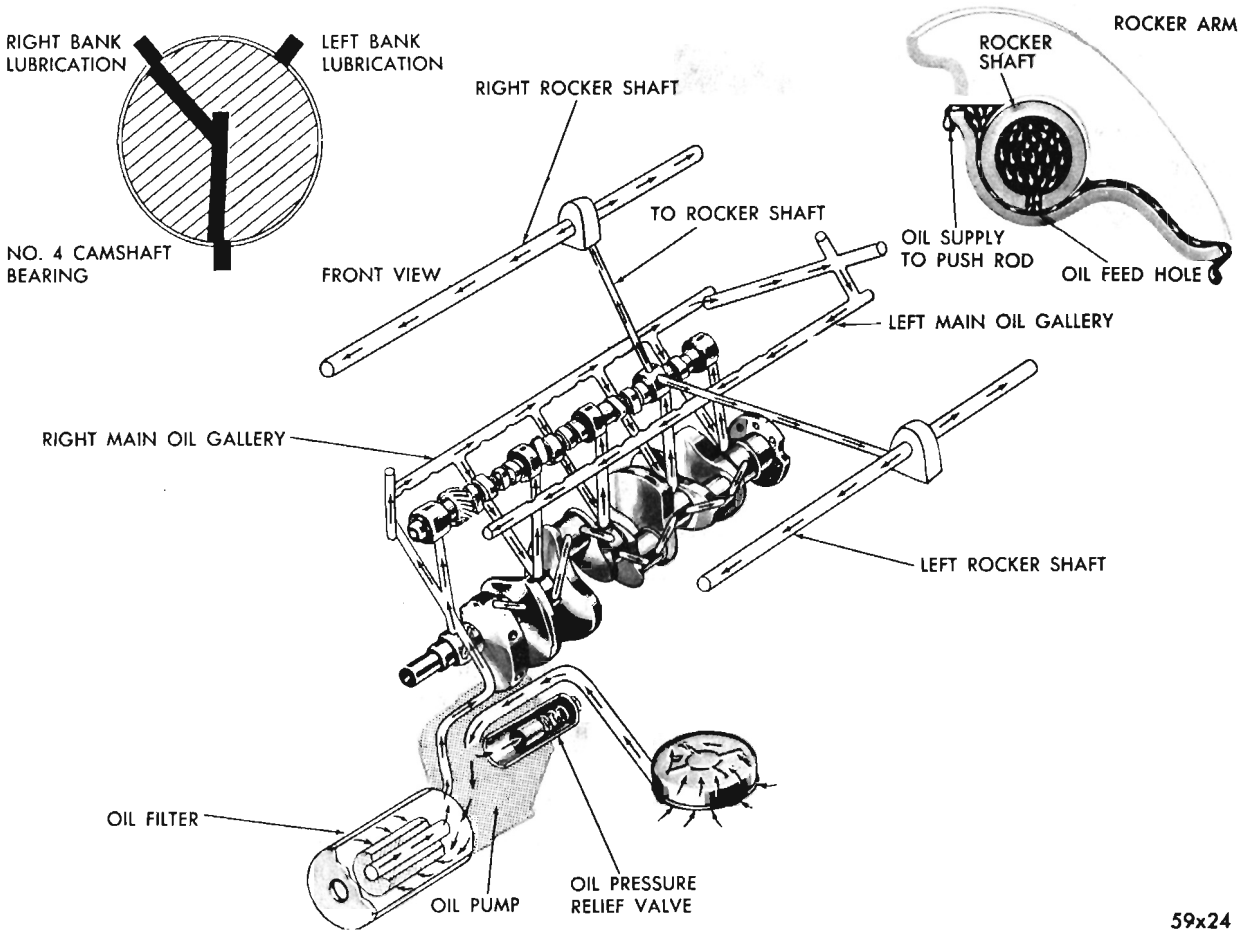


Fig. 62—Engine Oiling System (361, 383, 413 & 426 Cubic Inch)

26. OIL PUMP (Fig. 63)

Removal

On the 318 cubic inch engine, remove the oil pump from the rear main bearing cap.

361, 383, 413 and 426 cubic inch engines, remove the oil pump attaching bolts and remove the pump and filter assembly from the left front lower corner of the engine.

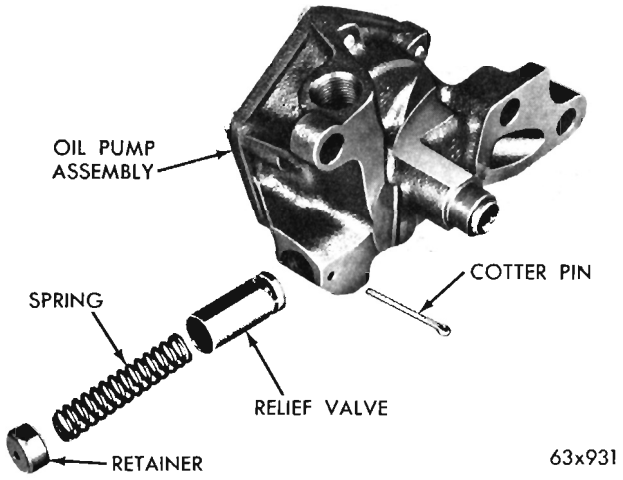


Fig. 63—Oil Pump Assembly (318 Cubic Inch)

Disassembly

(1) Remove the cover screws and remove the cover from the (361, 383, 413 and 426 cubic inch engines)

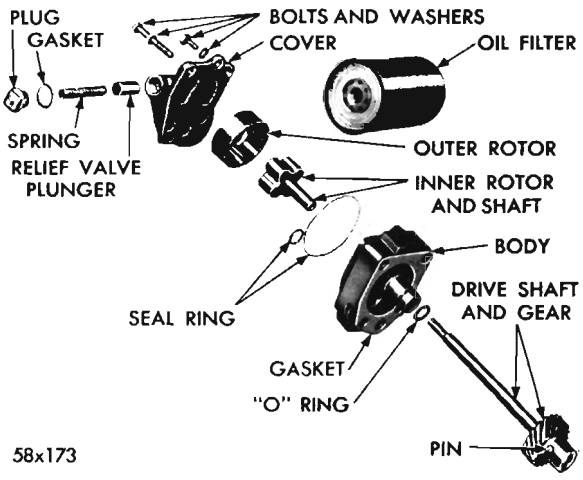


Fig. 64—Oil Pump and Filter (Disassembled View 361, 383, 413 & 426 Cubic Inch)

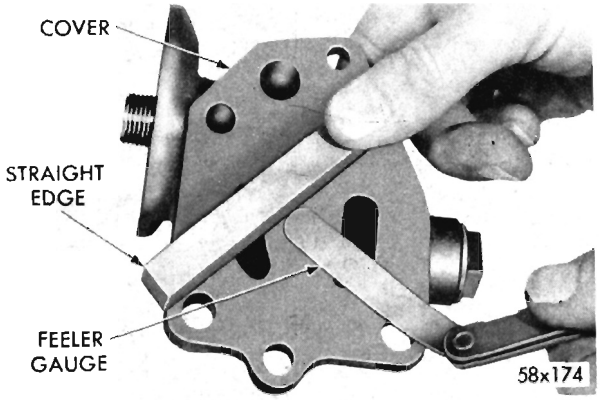


Fig. 65—Measuring Oil Pump Flatness



Fig. 67—Measuring Inner Rotor Thickness

filter base (Fig. 64).

(2) Remove the pump rotor and shaft and lift out the outer pump rotor.

(3) Remove the oil pressure relief valve plug carefully as it is under spring pressure. Remove the spring and the valve.

(4) Clean all parts thoroughly.

Inspection and Repair

(1) Lay a straightedge across the oil pump cover surface (Fig. 65). If a .0015 inch feeler gauge can be inserted between the cover and the straightedge, the cover should be replaced.

(2) For the 318 cubic inch engine, the outer rotor length should not be less than .825 inch (Fig. 66) and the outer diameter less than 2.469 inch. On the 361, 383, 413 and 426 cubic inch engines these dimensions should not be less than .943 and 2.469 inch respectively.

(3) If the inner rotor thickness measures less than .825 inch for the 318 cubic inch engine (Fig. 67) or .942 inch for 361, 383, 413 and 426 cubic inch engines, a new rotor should be installed.

(4) Place the outer rotor in pump body. Press the rotor to one side with the fingers and measure the clearance between the rotor and pump body. If the measurement is more than .012 inch, install a new oil pump body (Fig. 68). (This test is not necessary if a new pump body is being used.)

(5) Place the inner rotor in the outer rotor. Measure the clearance between the inner rotor and outer rotor. If measurement is more than .010 inch for 318 cubic inch engines or .010 inch (Fig. 69), for 361, 383, 413 and 426 cubic inch engine, install new pump rotors.

(6) Place a straightedge across the pump body (between bolt holes). If feeler gauge of more than .004

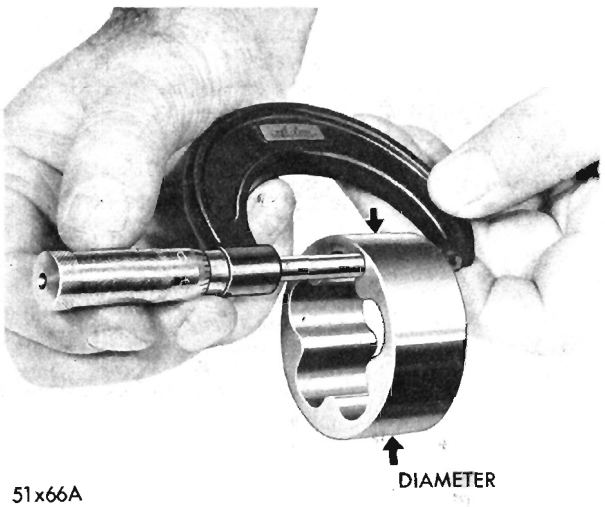


Fig. 66—Measuring Outer Thickness

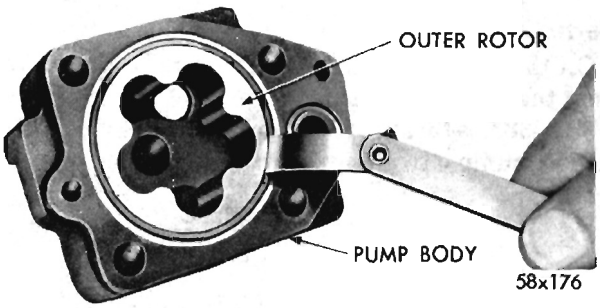


Fig. 68—Measuring Outer Rotor Clearance

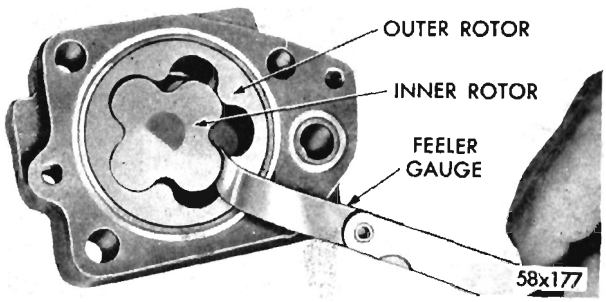


Fig. 69—Measuring Clearance Between Rotors

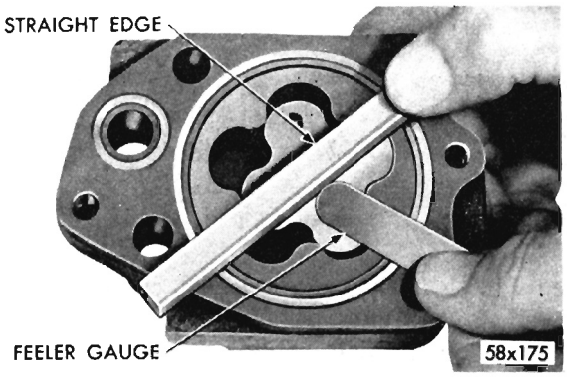


Fig. 70—Measuring Clearance Over Rotors

inch (Fig. 70) can be inserted between the rotors and a straightedge, install a new pump body and/or rotors.

(7) Inspect the oil pump relief valve plunger for scoring and for free operation in its bore. Small scores may be removed with 400 grit wet or dry paper providing extreme care is used not to round off the sharp edge portion of the valve.

(8) For 318 cubic inch engine the relief valve has a free length of $2\frac{1}{32}$ to $2\frac{3}{64}$ inch. For 361, 383, 413 and 426 cubic inch engines the relief valve has a free length of $2\frac{9}{32}$ to $2\frac{19}{64}$ inch and is red in color.

(9) If the oil pressure is low, inspect for worn bearings, or look for other causes of possible loss of oil pressure.

Assembly and Installation

(1) Assemble the oil pump, using new parts as required.

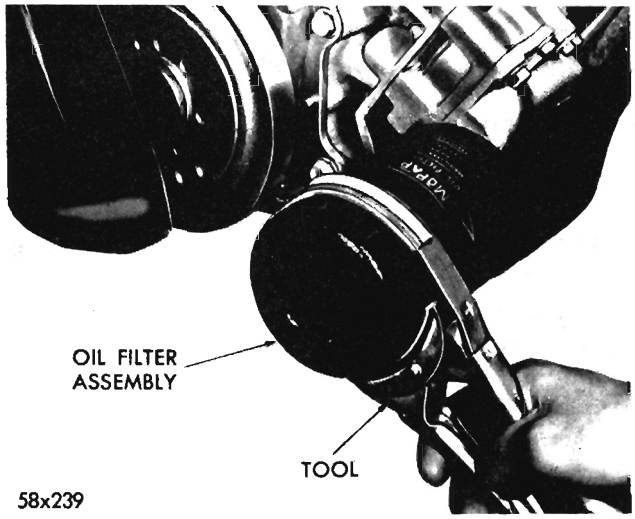


Fig. 71—Removing Oil Filter (Tool C-3654)

(2) Install new oil and seal rings between the cover and body. Tighten cover bolts to 10 foot-pounds torque for 318 cubic inch engine and 35 foot-pounds torque for 361, 383, 413 and 426 cubic inch engines.

(3) Install the oil pump and tighten attaching bolts to 35 foot-pounds torque.

Oil Filter

The oil filter should be replaced every six months to coincide with an engine oil change.

(1) Using Tool C-3654 (Fig. 71), unscrew the filter from the base on the bottom side of the engine and discard.

(2) Wipe the base clean.

(3) Screw a new filter on the base until the gasket

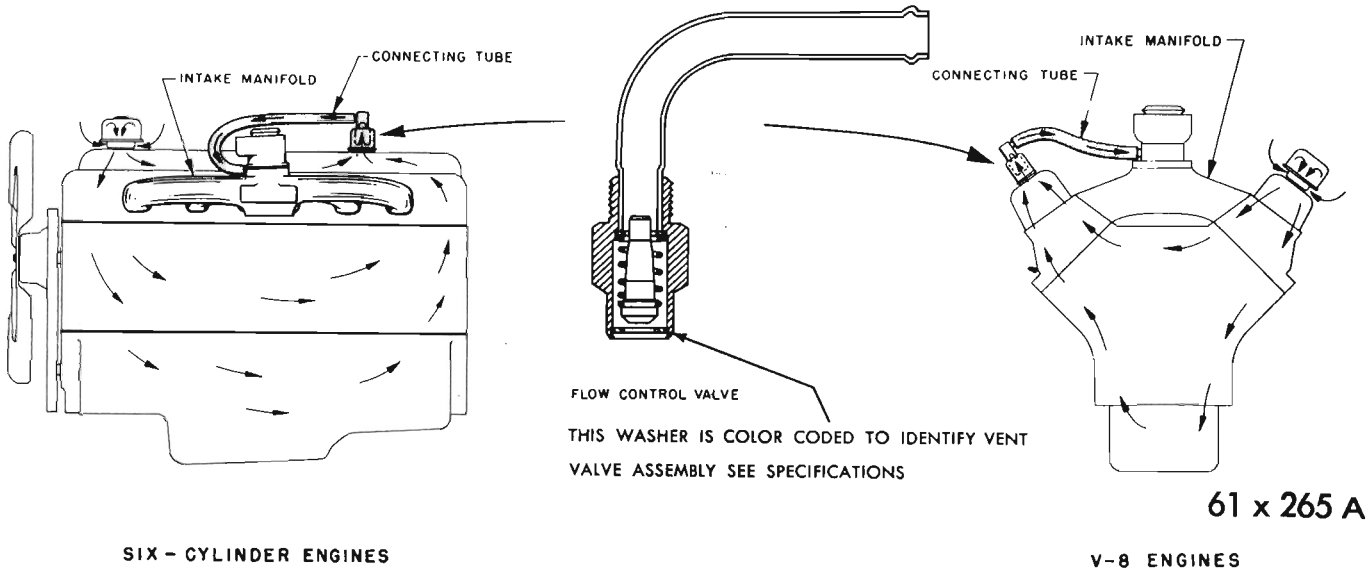


Fig. 72—Closed Crankcase Ventilating System

on the filter contacts the base. To obtain an effective seal, tighten filter **by hand** the additional number of turns **indicated on the replacement filter.** Start engine and inspect for leaks.

27. CRANKCASE VENTILATOR VALVE

All models are equipped with a positive crankcase ventilating system. This system is similar; but not identical, to systems used on the previous models (Fig. 72).

The system must be kept clean to maintain good engine performance and durability as deposits will accumulate in the valve, hoses and the carburetor parts, therefore, the ventilation system should be inspected at least every six months and the valve replaced once a year preferrable to coincide with the annual engine performance evaluation. This service will be required more frequently if the vehicle is used extensively for short trips — driving less than 10 miles — with frequent idling, such as city traffic.

With the engine running at idle, remove the ventilator valve and cap assembly from the rocker cover. If the valve is not plugged, a hissing noise will usually be heard as air passes through the valve and a strong vacuum should be felt when a finger is placed over the valve inlet. Replace the ventilator valve and cap assembly and remove the inlet breather cap. With the engine still running at idle, loosely hold a piece of stiff paper or a parts tag over the oil fill pipe. Within a few seconds, it should be sucked against the oil fill pipe with a holding force. If this occurs, a final test should be made to be certain the valve shuttle is free. A clicking noise should be heard when the valve is shaken (engine not running). If the noise is heard, the unit is satisfactory and no further service is necessary.

If the valve does not click when shaken or if the paper is not sucked against the fill pipe, the valve should be replaced and the system retested. (Do not attempt to clean the valve.) On 170 cubic inch engines use MoPar Ventilator Valve identified by a stamped number 6 on the end, a step on the end face, or a white end washer. On all other engines, use MoPar Ventilator Valve, identified by a letter "H" stamped on the end, a flat end or a black end washer. With a new valve installed, if the vacuum can be felt with the engine idling, the system is satisfactory. If the vacuum cannot be felt, it will be necessary to clean the ventilator hose and the passages in the lower part of the carburetor. The carburetor must be removed and cleaned by dipping the lower part of the carburetor in solvent. A pipe cleaner or small wire may be used in cleaning the passages. It is not necessary to disassemble the carburetor for this service.

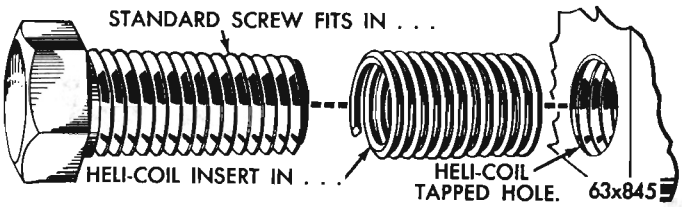


Fig. 73—Heli-Coil Installation

28. REPAIR OF DAMAGED OR WORN THREADS

Damaged or worn threads can be repaired by the use of Heli-Coils. Essentially, this repair consists of drilling out the worn or damaged threads, tapping the hole with a special Heli-Coil Tap, and installing a Heli-Coil Insert into the tapped holes. This brings the hole back to its original thread size (See Fig. 73).

The following chart lists the threaded hole sizes which are used in the engine block and the necessary tools and inserts for the repair of damaged or worn thread. Heli-Coil tools and inserts are readily available from automotive parts jobbers.

HELI-COIL INSERT			DRILL	TAP	INSERTING TOOL	EXTRACTING TOOL
Thread Size	Part No.	Insert Length	Size	Part No.	Part No.	Part No.
1/2-20	1185-4	3/8"	17/64 (.266)	4 CPB	528-4N	1227-6
5/16-18	1185-5	15/32"	Q (.332)	5 CPB	528-5N	1227-6
3/8-16	1185-6	9/16"	X (.397)	6 CPB	528-6N	1227-6
7/16-14	1185-7	21/32"	29/64 (.453)	7 CPB	528-7N	1227-16
1/2-13	1185-8	3/4"	33/64 (.516)	8 CPB	528-8N	1227-16

PART III
SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
Engine Will Not Start	(a) Weak battery.	(a) Test the battery specific gravity and recharge or replace as necessary.
	(b) Corroded or loose battery connections.	(b) Clean and tighten the battery connections. Apply a coat of petrolatum to the terminals.
	(c) Faulty coil or condenser.	(c) Test and replace if necessary.*
	(d) Dirty or corroded distributor contact points.	(d) Clean or replace as necessary.*
	(e) Moisture on ignition wires and distributor cap.	(e) Wipe wires and cap clean and dry.
	(f) Incorrect spark plug gap.	(f) Set the gap at .035″.
	(g) Incorrect ignition timing.	(g) Refer to "Ignition Timing."*
	(h) Faulty ignition cables.	(h) Replace any cracked or shorted cables.
	(i) Dirt or water in fuel line or carburetor.	(i) Clean the lines and carburetor.**
	(j) Carburetor flooded.	(j) Adjust the float level—check seats.**
	(k) Incorrect carburetor float setting.	(k) Adjust the float level—check seats.**
	(l) Faulty fuel pump.	(l) Install a new fuel pump.**
	(m) Carburetor percolating. No fuel in the carburetor.	(m) Measure the float level.** Adjust the bowl vent. Inspect the operation of the manifold control valve.
	(n) Faulty starting motor.	(n) Refer to "Starting Motor."*
Engine Stalls	(a) Idle speed set too low.	(a) Adjust carburetor.**
	(b) Idle mixture too clean or too rich.	(b) Adjust carburetor.**
	(c) Incorrect carburetor float setting.	(c) Adjust float setting.**
	(d) Incorrect choke adjustment.	(d) Adjust Choke.**
	(e) Leak in intake manifold.	(e) Inspect intake manifold gasket and replace if necessary.***
	(f) Dirty, burned or incorrectly gapped distributor contact points.	(f) Replace points and adjust.*
	(g) Worn or burned distributor rotor.	(g) Install a new rotor.
	(h) Incorrect ignition wiring.	(h) Install the correct wiring.
	(i) Faulty coil or condenser.	(i) Test and replace if necessary.*
Engine Loss of Power	(a) Incorrect ignition timing.	(a) Refer to "Ignition Timing."*
	(b) Worn or burned distributor rotor.	(b) Install a new rotor.
	(c) Wrong mechanical or vacuum advance (distributor).	(c) Install correct vacuum advance unit. Adjust the mechanical advance.
	(d) Excessive play in distributor shaft.	(d) Remove and repair distributor.*
	(e) Worn distributor shaft cam.	(e) Remove and repair distributor.*
	(f) Dirty or incorrectly gapped spark plugs.	(f) Clean plugs and set gap at .035″.
	(g) Dirt or water in fuel line or carburetor.	(g) Clean lines and carburetor.**

*Refer to the "Electrical and Instruments" Group 8 for service procedures.
**Refer to the "Fuel System" Group 14 for service procedures.
***Refer to the "Engine" Group 9 for service procedures.

SERVICE DIAGNOSIS—(Continued)

Condition	Possible Cause	Correction
Engine Loss of Power (Cont'd.)	(h) Incorrect carburetor float setting.	(h) Adjust float level.**
	(i) Faulty fuel pump.	(i) Install a new pump.
	(j) Incorrect valve timing.	(j) Refer to "Checking Valve Timing"***.
	(k) Blown cylinder head gasket.	(k) Install a new head gasket.***
	(l) Low compression.	(l) Test the compression of each cylinder.***
	(m) Burned, warped, pitted valves.	(m) Install new valves.***
	(n) Plugged or restricted exhaust system.	(n) Install new parts as necessary.
	(o) Faulty ignition cables.	(o) Replace any cracked or shorted cables.
	(p) Faulty coil or condenser.	(p) Test and replace as necessary.*
Engine Misses on Accelerator	(a) Dirty, burned, or incorrectly gapped distributor contact points.	(a) Replace the points and adjust.*
	(b) Dirty, or gap too wide in spark plugs.	(b) Clean the spark plugs and set the gap at .035".
	(c) Incorrect ignition timing.	(c) Refer to "Ignition Timing."*
	(d) Dirt in carburetor.	(d) Clean the carburetor.**
	(e) Acceleration pump in carburetor.	(e) Install a new pump.**
	(f) Burned, warped or pitted valves.	(f) Install new valves.***
	(g) Fault coil or condenser.	(g) Test and replace if necessary.*
Engine Misses at High Speed	(a) Dirt or water in fuel line or carburetor.	(a) Clean the lines and the carburetor.**
	(b) Dirty jets in carburetor.	(b) Clean the jets.**
	(c) Dirty or incorrectly gapped distributor contact points.	(c) Clean or replace as necessary.*
	(d) Dirty or gap set too wide in spark plug.	(d) Clean the spark plugs and set the gap at .035".
	(e) Worn distributor shaft cam.	(e) Remove and repair the distributor.*
	(f) Worn or burned distributor rotor.	(f) Install a new rotor.
	(g) Excessive play in distributor shaft.	(g) Remove and repair the distributor.*
	(h) Faulty coil or condenser.	(h) Test and replace if necessary.*
	(i) Incorrect ignition timing.	(i) Refer to "Ignition Timing."*
Noisy Valves	(a) High or low oil level in crankcase.	(a) Check for correct oil level.***
	(b) Thin or diluted oil.	(b) Change oil.***
	(c) Low oil pressure.	(c) Check the engine oil level.***
	(d) Dirt in tappets.	(d) Clean the tappets.***
	(e) Bent push rods.	(e) Install new push rods.***
	(f) Worn rocker arms.	(f) Inspect the oil supply to rockers.***
	(g) Worn tappets.	(g) Install new tappets.***
	(h) Worn valve guides.	(h) Ream and install new valves with O/S stems.***
	(i) Excessive run-out of valve seats or valve faces.	(i) Grind the valve seats and valves.***

*Refer to the "Electrical and Instruments" Group 8 for service procedures.
**Refer to the "Fuel System" Group 14 for service procedures.
***Refer to the "Engine" Group 9 for service procedures.

SERVICE DIAGNOSIS—(Continued)

Condition	Possible Cause	Correction
Connecting Rod Noise	(a) Insufficient oil supply.	(a) Check engine oil level. Inspect oil pump relief valve, damper and spring.***
	(b) Low oil pressure.	(b) Check the engine oil level.***
	(c) Thin or diluted oil.	(c) Change oil to correct viscosity.
	(d) Excessive bearing clearance.	(d) Measure the bearings for correct clearances or failures.***
	(e) Connecting rod journals out-of-round.	(e) Remove the Crankshaft and regrind journals.***
	(f) Misaligned connecting rods.	(f) Replace the bent connecting rods.***
Main Bearing Noise	(a) Insufficient oil supply.	(a) Check the engine oil level. Inspect the oil pump relief valve, damper and spring.***
	(b) Low oil pressure.	(b) Check the engine oil level.***
	(c) Thin or diluted oil.	(c) Change the oil to correct viscosity.
	(d) Excessive bearing clearance.	(d) Measure the bearings for correct clearances or failures.***
	(e) Excessive end play.	(e) Check No. 3 main bearing for wear on flanges.***
	(f) Crankshaft journal out-of-round or worn.	(f) Remove the crankshaft and regrind journals.
	(g) Loose flywheel or torque converter.	(g) Tighten to the correct torque.
Oil Pumping at Rings	(a) Worn, scuffed, or broken rings.	(a) Hone cylinder bores and install new rings.***
	(b) Carbon in oil ring slots.	(b) Install new rings.***
	(c) Rings fitted too tight in grooves.	(c) Remove the rings. Check the grooves. If groove is not proper width, replace the piston.***
Oil Pressure Drop	(a) Low oil level.	(a) Check the engine oil level.
	(b) Faulty oil pressure sending unit.	(b) Install a new sending unit.
	(c) Thin or diluted oil.	(c) Change the oil to correct viscosity.
	(d) Oil pump relief valve stuck.	(d) Remove the valve and inspect, clean, and reinstall.
	(e) Oil pump suction tube loose bent or cracked.	(e) Remove the oil pan and install a new tube if necessary.
	(f) Clogged oil filter.	(f) Install a new oil filter.
	(g) Excessive bearing clearance.	(g) Measure the bearings for the correct clearance.***

*Refer to the "Electrical and Instruments" Group 8 for service procedures.
**Refer to the "Fuel System" Group 14 for service procedures.
***Refer to the "Engine" Group 9 for service procedures.

GROUP 11

EXHAUST SYSTEM

CONTENTS

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Torque Reference	1	Manifold Heat Control Valve (8-Cylinder) 318 Cu. In. Engine	4
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Manifold Heat Control Valve (6-Cylinder)	2	Exhaust Pipes, Mufflers and Tail Pipes	5
Intake Manifold (8-Cylinder)	3	Service Diagnosis	7
Exhaust Manifold (8-Cylinder)	3		

TORQUE REFERENCE

	Foot-Pounds	
	6-Cylinder	8-Cylinder
Ball Joint Screw		20
Converter Housing Bracket Screw		15
Exhaust Manifold Nuts		30
Exhaust Pipe Flange Nuts	30	40
Exhaust Pipe Support Clamp Bolts		10
Heat Control Counterweight Clamp Bolt	50 Inch Pounds	50 Inch Pounds
Intake to Exhaust Manifold Bolts	15	
Manifold to Cylinder Head Nuts	10	

PLYMOUTH AND VALIANT (6 Cylinder Engine)

The intake and exhaust manifold, Figs. 1 and 2 are located on the same side of the engine. A thermostatic heat control valve is incorporated to direct the exhaust heat to a heat chamber beneath the carburetor to help vaporize the fuel.

SERVICE PROCEDURES

1. INTAKE AND EXHAUST MANIFOLD ASSEMBLY (Figs. 1 and 2)

Removal

(1) Remove the air cleaner.

(2) Remove the vacuum control tube at the carburetor and distributor.

(3) Remove the fuel line and remove the carburetor.

(4) Disconnect the exhaust pipe at the exhaust manifold flange.

(5) Remove the nuts and conical washers holding the intake and exhaust manifolds to the cylinder head. (Fig. 1).

(6) Remove the assembly from the cylinder head.

(7) Remove the three bolts holding the intake manifold to the exhaust manifold (Fig. 1).

(8) Separate the manifolds and discard the gasket.

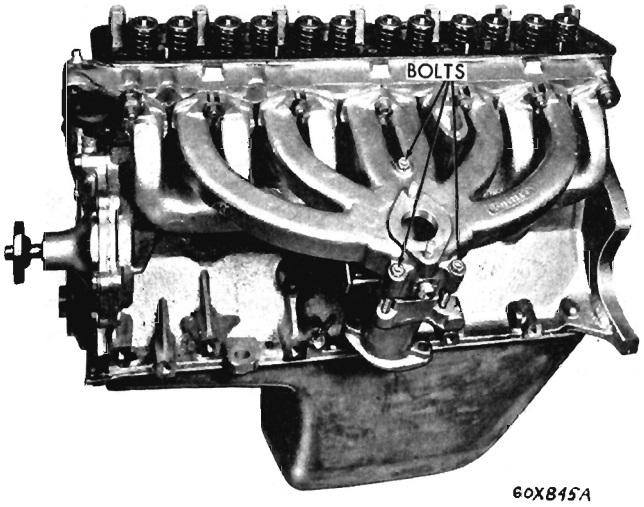


Fig. 1—Intake Manifold (6 Cylinder)

(9) Clean the manifolds in solvent and dry with compressed air.

(10) Inspect the mating surfaces of the manifolds for parallelism with a straightedge.

(11) Inspect the manifolds for cracks or distortion.

Installation

(1) Install a new gasket between the intake and exhaust manifold.

(2) Install the three bolts holding the intake manifold to the exhaust manifold. **Do not tighten the bolts.**

(3) Position the intake and exhaust manifold on the cylinder head using a new gasket.

(4) Install the brass washers and special nuts on the end manifold studs.

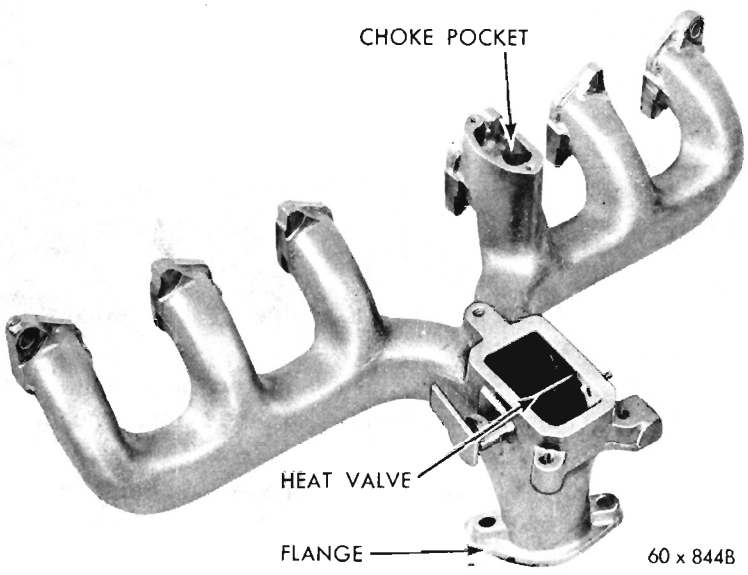


Fig. 2—Exhaust Manifold (6 Cylinder)

(5) Install the triangular washers on the front and rear end lower manifold studs, also on the upper and lower exhaust manifold studs on number 2 and 5 cylinders.

The six triangular washers should be positioned squarely on the machined surfaces of both the intake and exhaust manifold retaining pads. These washers must be installed with the conical side pointing away from the manifold. Install the washers and nuts only when the engine and exhaust system is cold.

(6) Install the other conical washers with the cup side against the manifold.

(7) Tighten all manifold nuts to 10 foot-pounds torque. **Do not over tighten these nuts as they can be easily stripped.**

(8) Tighten the three bolts holding the intake manifold to the exhaust manifold to 15 foot-pounds torque.

(9) Connect the exhaust pipe to the exhaust manifold flange and tighten nuts to 30 foot-pounds torque.

(10) Install the carburetor and connect the fuel line, throttle linkage and vacuum control tube.

(11) Install the air cleaner.

2. MANIFOLD HEAT CONTROL VALVE (Fig. 3)

The heat control valve should be inspected and lubricated with solvent 1879318 at every lubrication or engine tune-up. With the engine idling, accelerate momentarily to wide open throttle. The counterweight should respond by moving counter-clockwise approximately ½ inch and return to its normal position. If no movement is observed, the shaft is frozen or the coil spring is weak or broken.

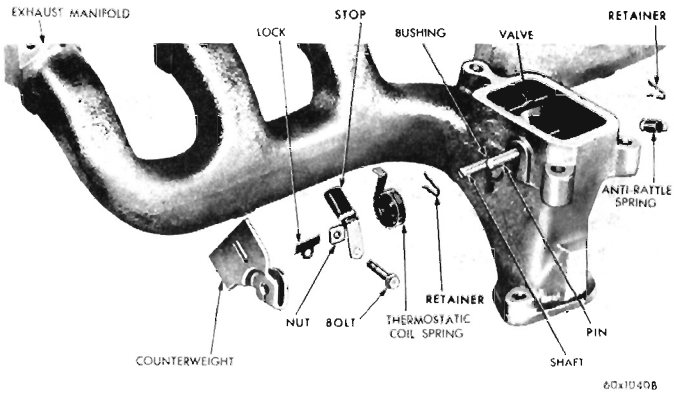


Fig. 3—Manifold Heat Control Valve

Removal

(1) Remove the counterweight, key and stop from the end of the shaft.

(2) Unhook the coil spring from the pin and remove from the valve shaft slot.

(3) If the valve shaft is frozen in the manifold, apply manifold heat control valve solvent. MoPar Part Number 1879318 to both ends of the shaft and allow to stand for several minutes. Work the shaft back and forth until it turns freely.

Installation

(1) Position the shaft in the **extreme clockwise** position.

(2) Place a new coil spring in the shaft slot, and position with outer end (tongue) of coil spring in the upper left hand position.

(3) Wrap the outer end (tongue) of the coil spring clockwise and engage under the pin.

(4) Place the counterweight assembly on the shaft (with the shield in an upward position) and insert the key in the shaft slot.

(5) Center the counterweight assembly on the shaft and turn the valve counter-clockwise until the bumper passes the pin

(6) Press the counterweight on the shaft until it is seated. Tighten the clamp bolt 50 inch-pounds with torque wrench Tool C-3380.

PLYMOUTH (8 Cylinder Engines)

3. INTAKE MANIFOLDS (Figs. 4 and 5) (318 Cu. In. Engine)

With the intake manifold removed. (See Group 9 "Engine".)

(1) Clean the manifold in solvent. Blow dry with compressed air.

(2) Inspect the exhaust crossover passage and pressure test for leakage into any of the intake passages.

(3) Inspect the mating surfaces for parallelism.

(4) Use new gaskets when installing the manifold.

4. EXHAUST MANIFOLD

Removal

(1) Disconnect the spark plug cables.

(2) Remove the alternator.

(3) Disconnect the exhaust pipes at the exhaust manifold flanges.

(4) Remove the nuts that hold the exhaust manifolds to the cylinder heads.

(5) Slide the manifolds off the studs and away from the cylinder heads.

(6) Clean the intake and exhaust manifolds in solvent. Blow dry with compressed air.

(7) Inspect the manifolds for cracks and distortion.

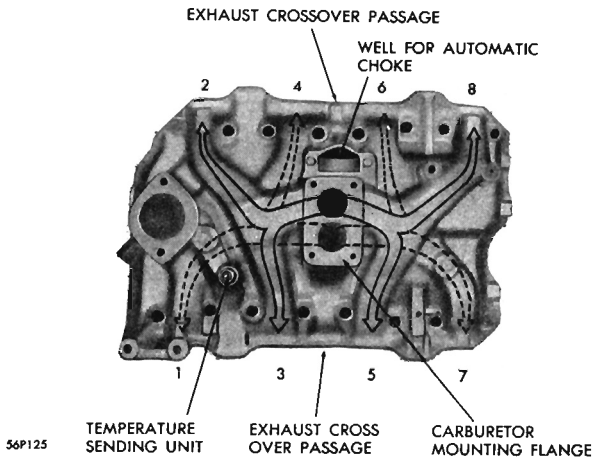


Fig. 4—Intake Manifold (318 Cu. In. Engine)

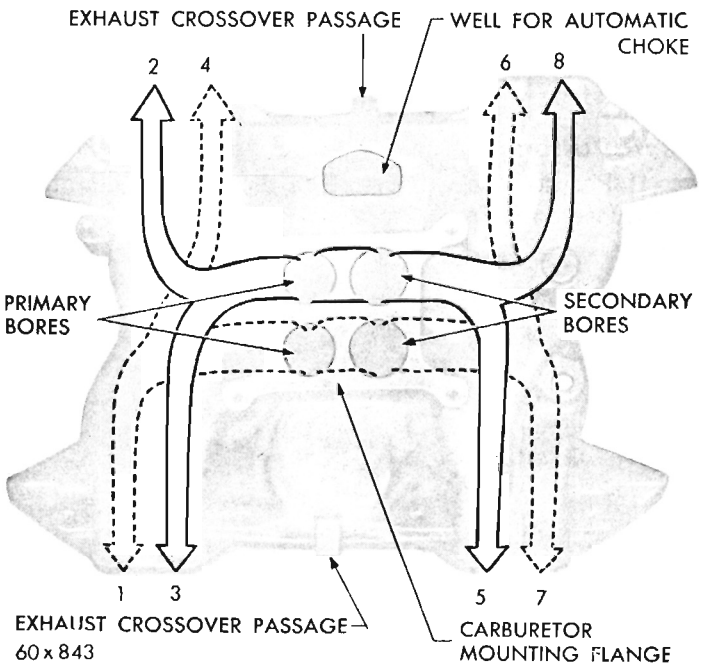


Fig. 5—Intake Manifold (361 Cu. In. Engine)

Installation

(1) Place the exhaust manifolds on the studs on the cylinder heads and install the nuts. Tighten to 30 foot-pounds torque.

(2) Connect the exhaust pipes at the exhaust manifolds. Tighten the nuts to 40 foot-pounds torque.

(3) Install the alternator and adjust the belt tension.

(4) Connect spark plug cables to the spark plugs.

5. MANIFOLD HEAT CONTROL VALVE (8 Cylinder 318 Cu. In. Engine)

Inspect operation of heat control valve at every lubrication and oil change period. With engine idling accelerate to wide open throttle and release quickly. The counterweight should respond by moving clockwise approximately ½ inch and returning to its normal position. If no movement is observed, the valve shaft may be frozen or the coil is weak or broken. In either case, the heat control valve should be disassembled and replaced with new parts.

Removal (Fig. 6)

(1) Loosen the retaining nut and remove the counterweight assembly from the end of the shaft, exposing the thermostatic coil.

(2) Unhook the coil from the pin and remove by sliding out of valve shaft slot.

(3) If the valve shaft is frozen in the manifold, apply manifold heat control valve solvent, MoPar Part Number 1879318 and allow to stand several minutes. Loosen by turning the shaft clockwise or counter-clockwise (depending on frozen position) until the shaft is free.

Installation

(1) Position the valve shaft in the extreme counter-clockwise position.

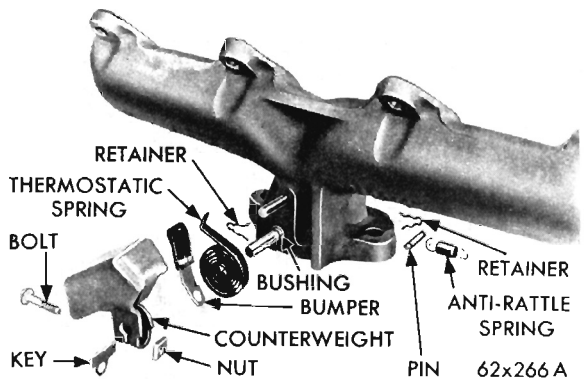


Fig. 6—Manifold Heat Control Valve (318 Cu. In. Engine)

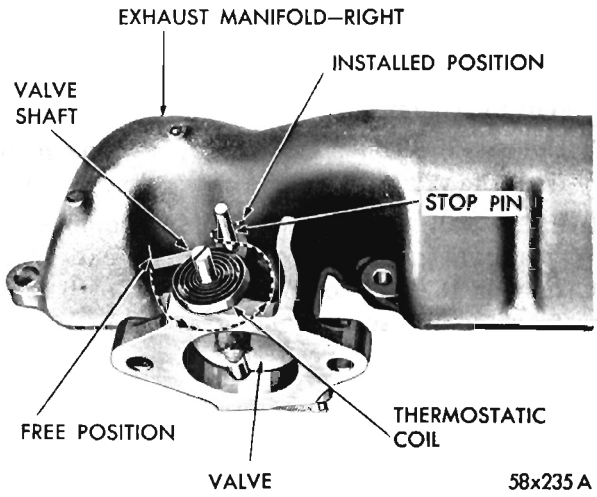


Fig. 7—Positioning Thermostatic Spring

(2) Place the new coil in position over shaft slot, with outer end (tongue) of coil in upper left hand position. Press the inner end of the coil into slot of the shaft and seat firmly.

(3) Move the outer end (tongue) counter-clockwise and hook under pin, as shown in Figure 7.

(4) Place the counterweight assembly over the shaft (with weight in upward position) and insert the lock in the shaft slot, as shown in Figure 8. Center the counterweight on the shaft and turn the assembly clockwise until the stop passes the pin. Press the counterweight on the shaft until seated, install stop, and tighten the clamp bolt 50 inch-pounds with torque wrench Tool C-3380. **If the fabric on the stop is worn, replace with new stop.** (Fig. 6.) Test the valve for the proper operation.

6. MANIFOLD HEAT CONTROL VALVE (361 Cu. In. Engine)

Inspect the operation of the heat control valve (Fig.

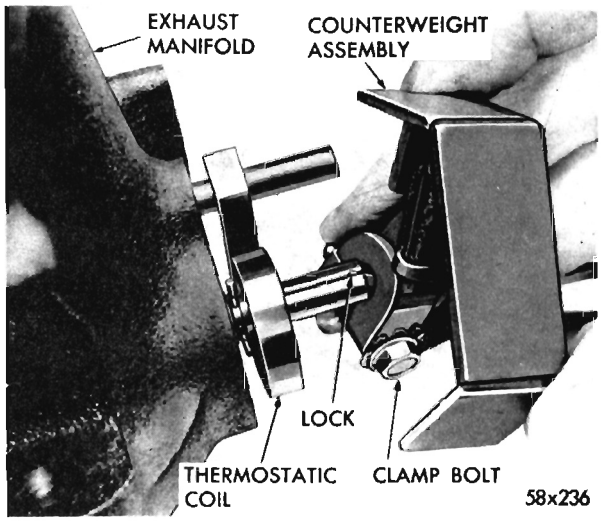


Fig. 8—Installing Counterweight Assembly

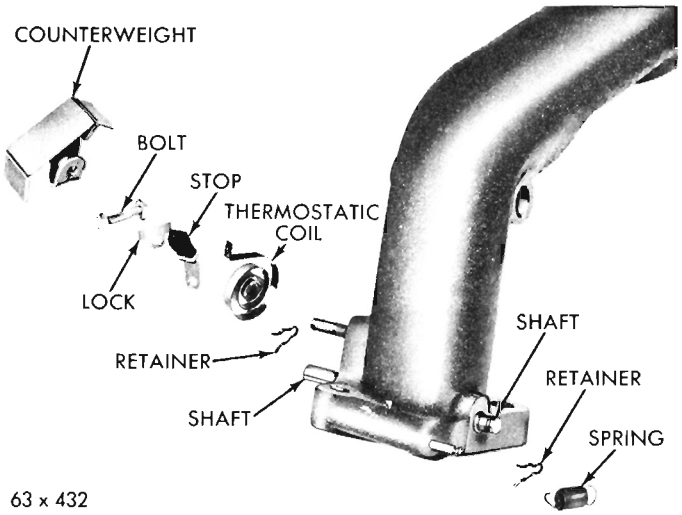


Fig. 9—Manifold Heat Control Valve

9) and apply manifold heat control valve solvent MoPar Part No. 1879318 to both ends of the valve shaft. With engine idling, accelerate the engine and release quickly. The counterweight should respond by moving counter-clockwise approximately ½ inch and return to its normal position.

Removal

(1) Loosen the retaining nut and remove the counterweight assembly from the end of the shaft, exposing the thermostatic coil.

(2) Unhook the coil from the pin and remove by sliding out of valve shaft slot.

(3) If the valve shaft is frozen in the manifold, apply manifold heat control valve solvent, MoPar Part No. 1879318, and allow to stand several minutes. Loosen by rotating the shaft back and forth until the shaft turns easily.

Installation

(1) Place the heat control valve in the fully clockwise position.

(2) Position the thermostatic spring in the valve shaft slot with the tongue of the spring facing downward on the left hand side.

(3) Turn the thermostatic spring end upward and place the tongue of the spring behind the pin.

(4) Install the counterweight assembly on the valve shaft being sure the stop is positioned against the pin.

(5) Tighten the counterweight clamp bolt 50 inch-pounds with torque wrench Tool C-3380.

(6) Test the operation of the manifold heat control valve.

7. EXHAUST PIPES MUFFLERS AND TAIL PIPES (Figs. 10, 11 and 12)

Removal

(1) Remove the clamps from the exhaust pipes, mufflers and tail pipes.

(2) Disconnect the exhaust pipe at the exhaust manifold and remove the exhaust pipe.

(3) Remove the muffler and extension pipe assembly.

(4) Raise the rear of the vehicle to relieve the body weight from the rear springs.

(5) Remove the tail pipes.

Installation

(1) Assemble the exhaust system loosely.

(2) Connect the exhaust pipes at the exhaust manifolds. Tighten the nuts to 40 foot-pounds torque.

(3) Adjust the hanger heights.

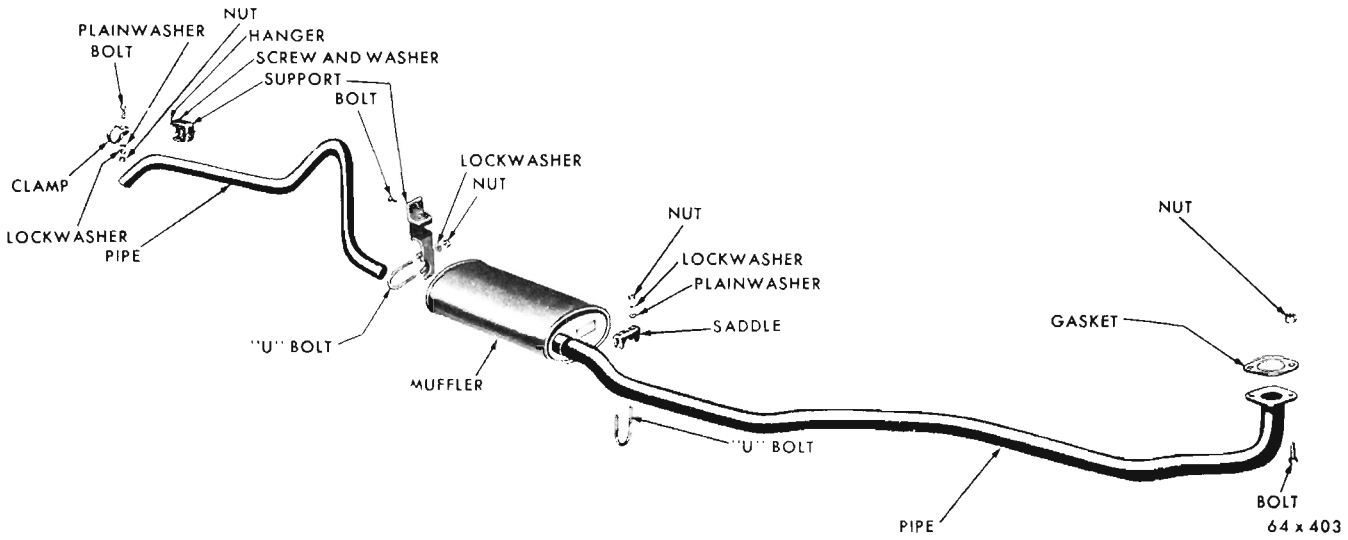


Fig. 10—Exhaust System (Valiant)

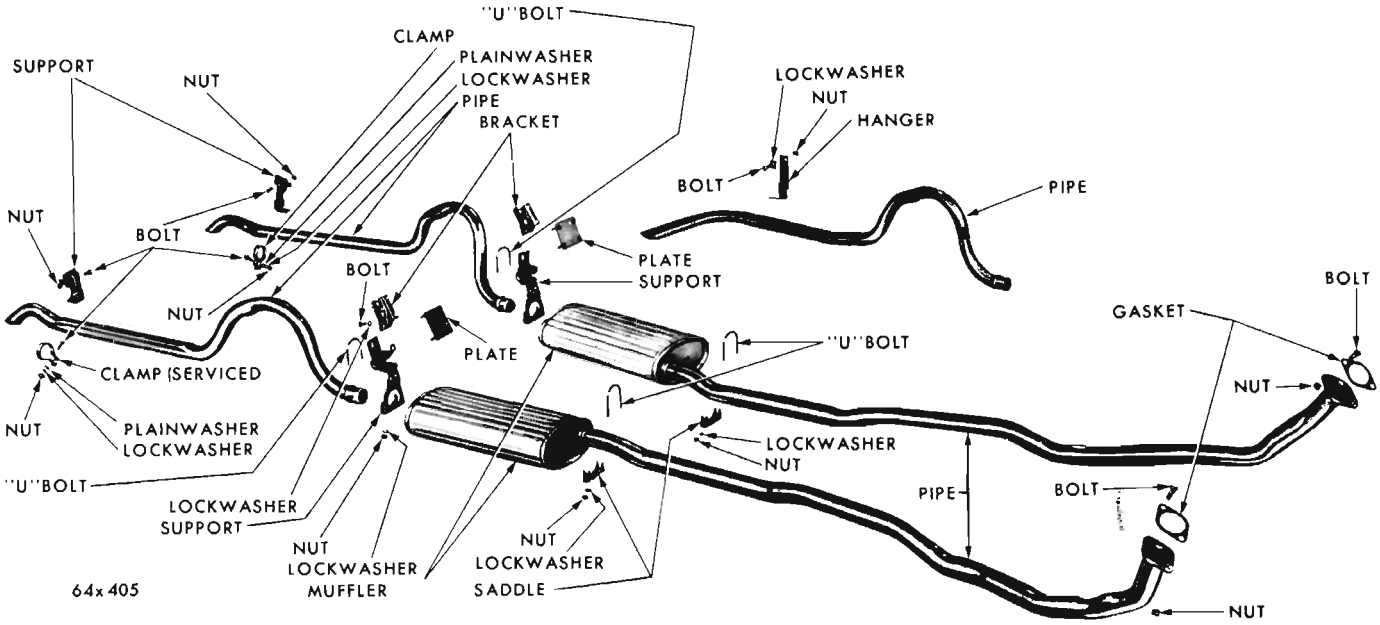


Fig. 11—Exhaust System (Plymouth) (8-Cylinder)

(4) Tighten all the slip joint clamps to 10 foot-pounds torque. Work from rear to front of vehicle.

(5) Tighten all the support clamps to 10 foot-pounds torque.

(6) Tighten the ball joint screws to 20 foot-pounds torque. The lower surfaces of the flanges should be parallel to each other and perpendicular to the pipe axis.

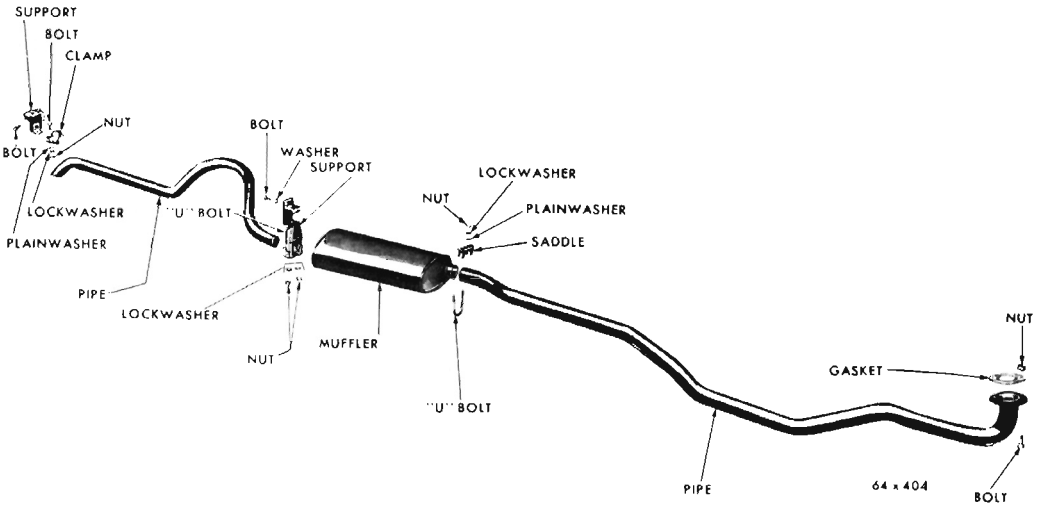


Fig. 12—Exhaust System (Plymouth) (6-Cylinder)

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
Excessive Exhaust Noise	(a) Leaks at the pipe joints.	(a) Tighten the clamps at the leaking joints.
	(b) Burned or blown out muffler.	(b) Replace the muffler assembly.
	(c) Burned or rusted out exhaust pipe.	(c) Replace the exhaust pipe.
	(d) Exhaust pipe leaking at the manifold flange.	(d) Install a new gasket and tighten the exhaust pipe flange nuts 40 foot-pounds torque.
	(e) Exhaust manifold cracked or broken.	(e) Replace the manifold.
	(f) Leak between the manifold and cylinder block.	(f) Tighten the manifold to cylinder block nuts 30 foot-pounds torque.
Leaking Exhaust Gases	(a) Leaks at the pipe joints.	(a) Tighten the clamps at the leaking joints.
	(b) Damaged or improperly installed gaskets.	(b) Replace gaskets as necessary.
	(c) Restriction in muffler or tail pipe.	(c) Remove the restriction, if possible or replace as necessary.
Engine Hard to Warm Up or Will Not Return to Normal Idle	(a) Heat control valve frozen in the open position.	(a) Free up the manifold heat control valve using solvent MoPar Part No. 1879318.
Noise in Manifold	(a) Thermostatic spring broken.	(a) Replace the spring.
	(b) Weak or broken anti-rattle spring.	(b) Replace the spring.
Manifold Heat Control Valve Rattle	(a) Thermostatic spring broken.	(a) Replace the thermostatic spring.
	(b) Broken or weak anti-rattle spring.	(b) Replace the spring.

GROUP 14

FUEL SYSTEM (PUMP, CARBURETOR, TANK)

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HOLLEY 1920 R SERIES CARBURETORS

SPECIFICATIONS

CARBURETOR						
Type	Single Throat Down Draft					
Model	Holley—#1920					
Manual Trans.	R-2765A	—	R-2767A	—	R-2769A	—
Automatic Trans.	—	R-2766A	—	R-2768A	—	R-2770A
Engine Displacement (Cu. In.)	170	170	225	225	225	225
Bore	1 9/16	1 11/16	1 11/16	1 11/16	1 11/16	1 11/16
Venturi	1 1/4	1 5/16	1 5/16	1 5/16	1 5/16	1 5/16

HOLLEY 1920 R SERIES CARBURETORS

SPECIFICATIONS—(Continued)

Main Metering Jet						
Standard	53	58	57	56	57	56
One Step Lean	—	—	56	55	56	55
2 Steps Lean	—	—	55	54	55	54
ADJUSTMENTS						
Float Setting	Use Gauge		Use Gauge		Use Gauge	
Fuel Level Height (Wet)	1 1/16"	1 1/16"	1 1/16"	1 1/16"	1 1/16"	1 1/16"
Vacuum Kick	3/16"	1 1/64"	13/64"	5/32"	13/64"	5/32"
Cam Position Adjustment	1 5/64"	1 5/64"	1 5/64"	1 5/64"	1 5/64"	1 5/64"
Choke Unloader (See Fast Idle Index Adj.)	—	—	—	—	—	—
Bowl Vent Valve	1/16"	1/16"	1/16"	1/16"	1/16"	1/16"
Idle Mixture Screw (turns open) Approx.	1	1	1	1	1	1
Idle Speed (Curb Idle rpm)	550	550	550	550	550	550
Fast Idle Speed (Engine Hot and Screw on Lowest Step of Cam rpm)						
Manual Trans.	700	—	70	—	700	—
Automatic Trans.	—	700	—	700	—	700
CHOKE						
Control	Thermostatic Coil Spring					
Type	Well	Well	Well	Well	Well	Well
Setting	2 Notches Rich		2 Notches Rich		2 Notches Rich	

FUEL PUMP

SPECIFICATIONS

FUEL PUMP	6	V-8	V-8
ENGINE DISPLACEMENT	170 Cu. In. 225 Cu. In.	318 Cu. In.	361, 383, 426 Cu. In.
Make	Carter	Carter	Carter
Model	MS-3674S	MS-3673S	MS-3672S
Type	Diaphragm	Diaphragm	Diaphragm
Number of Valves	2	2	2
Driven By	Camshaft	Camshaft	Camshaft
Pump Pressure (pounds)	3½ to 5	3½ to 5	3½ to 5

FUEL TANK

SPECIFICATIONS

Location	Under Trunk Compartment (All except 116" W/B Station Wagon) Station Wagon—Left Rear Quarter Panel
Capacity (gals.)	106" W/B—18 116" W/B—19—Conventional 106" W/B—18 116" W/B—21—Station Wagon

BBS CARBURETOR

SPECIFICATIONS

CARBURETOR				
Type	Ball and Ball Single Throat		Ball and Ball Single Throat	
Model	Standard		Fleet	Taxi
Manual Transmission	BBS-3675S	—	BBS-3681S	BBS-3664S
Automatic Transmission	—	BBS-3676S	BBS-3681S	BBS-3664S
Engine Displacement	**170 Cu. In.**	**170 Cu. In.**	**170 Cu. In.**	**170/225 Cu. In.**
Bore	1 9/16"	1 11/16"	1 9/16"	1 9/16"
Venturi	1 1/4"	1 11/32"	1 1/4"	1 1/4"
Main Metering Jet				
Standard	#120-267S	#120-263S	#120-209S	#120-209S
One Step Lean	#120-264S	#120-267S	#120-211S	#120-211S
Two Steps Lean	#120-265S	#120-268S	#120-210S	#120-210S
Step-Up Wire (Standard)	75-1593	75-1590	75-1207	75-1208
Diameter	(.026")	(.030")	(.021")	(.023")
ADJUSTMENTS				
Float Setting	1/4"	1/4"	1/4"	5/16"
Choke Unloader	3/16"	3/16"	3/16"	3/16"
Fast Idle Cam Position	15/64"	7/32"	15/64"	15/64"
Vacuum Kick	11/64"	1/8"	11/64"	11/64"
Bowl Vent Valve Setting (from under side of valve to air horn)	.060"	.060"	.060"	.060"
Idle Mixture Screw (turns open)	1	1	1	1
Idle Speed R.P.M. (curb idle)**	550	550	550	550
Fast Idle Speed (engine hot and screw on Lowest step of cam)	700	700	700	700
CHOKE				
Control	Thermostatic Coil Spring		Thermostatic Coil Spring	
Type	Well	Well	Well	Well
Setting	2 Notches Rich	2 Notches Rich	2 Notches Rich	2 Notches Rich

With Headlights **ON and Air Conditioning Turned **ON** (if so equipped)

BBS CARBURETOR

SPECIFICATIONS

CARBURETOR				
Type	Ball and Ball Single Throat		Ball and Ball Single Throat	
Model	High Perf.	High Perf.	Standard	
Manual Transmission	BBS-3677S	—	BBS-3679S	—
Automatic Transmission	—	BBS-3678S	—	BBS-3680S
Engine Displacement	**225 Cu. In.**	**225 Cu. In.**	**225 Cu. In.**	**225 Cu. In.**
Bore	1 11/16"	1 11/16"	1 11/16"	1 11/16"
Venturi	1 11/32"	1 11/32"	1 11/32"	1 11/32"
Main Metering Jet				
Standard	#120-263S	#120-263S	#120-263S	#120-263S
One Step Lean	#120-267S	#120-267S	#120-267S	#120-267S
Two Steps Lean	#120-268S	#120-268S	#120-268S	#120-268S
Step-Wire (Standard)	75-1593	75-1590	75-1593	75-1590
Diameter	(.026")	(.030")	(.026")	(.030")
ADJUSTMENTS				
Float Setting	1/4"	1/4"	1/4"	1/4"
Choke Unloader	3/16"	3/16"	3/16"	3/16"
Fast Idle Cam Position	7/32"	3/16"	7/32"	3/16"
Vacuum Kick	11/64"	1/8"	11/64"	1/8"
Bowl Vent Valve Setting (from underside of valve to air horn)	.060"	.060"	.060"	.060"
Idle Mixture Screw (turns open)	1	1	1	1
Idle Speed R.P.M. (curb idle)**	550	550	550	550
Fast Idle Speed (engine hot and screw on Lowest step of cam)	700	700	700	700
CHOKE				
Control	Thermostatic Coil Spring		Thermostatic Coil Spring	
Type	Well	Well	Well	Well
Setting	2 Notches Rich	2 Notches Rich	2 Notches Rich	2 Notches Rich

With Headlights **ON and Air Conditioning Turned **ON** (if so equipped)

BBD SERIES CARBURETORS

SPECIFICATIONS

CARBURETOR			
Type	**Ball and Ball Dual Downdraft**		**Ball and Ball Dual Downdraft**
Model			
Manual Transmission	BBD-3682S	—	—
Automatic Transmission	—	BBD-3683S	BBD-3684S
Engine Displacement	**318 Cu. In.**		**361 Cu. In.**
Bore	1 7/16"	1 7/16"	1 9/16"
Venturi	1 3/16"	1 3/16"	1 5/16"
Main Metering Jet			
Standard	No. 120-213S	No. 120-213S	No. 120-248
One Step Lean	No. 120-212S	No. 120-212S	No. 120-249
Two Steps Lean	No. 120-209S	No. 120-209S	No. 120-250
Step-Up Wire (Standard)	75-1616	75-1617	75-1598
Diameter (2 stage)	.019" x .023"	.019" x .024"	.031" x .026"
ADJUSTMENTS			
Accelerator Pump Travel	—	—	1" ± 1/64"
Float Setting (at Center of Floats)	1/4"	1/4"	5/16"
Bowl Vent Valve (At Idle)	1/16"	1/16"	1/16"
Choke Unloader	1/4"	1/4"	1/4"
Idle Mixture Screws (Turns Open)	1	1	3/4
Idle Speed RPM (Curb Idle)	500	500	500
(Air Conditioning **ON**)	500	500	500
Fast Idle Speed RPM	700	700	700
Vacuum Kick	3/16"	3/16"	11/64"
Fast Idle Cam Position Adjustment	1/4"	1/4"	15/64"
CHOKE			
Control	Thermostatic Coil Spring		Thermostatic Coil Spring
Type	Well	Well	Well
Setting	On Index	On Index	2 Notches Rich

SPECIFICATIONS

STROMBERG CARBURETOR

CARBURETOR	WW-3	
Model		
Manual Transmission	WW3-239	—
Automatic Transmission	—	WW3-240
Engine Displacement	318 Cu. in.	
Type	Stromberg Dual Throat Downdraft	
Bore	1 7/16"	1 7/16"
Venturi	1 3/16"	1 3/16"
Main Metering Jet		
Standard	(388539) .055"	.054"
1 Size Lean	(388539) .053"	.052"
2 Sizes Lean	(388539) .051"	.050"
Power Jet (2 Stage)	.028 and .041"	.031 and .045"
ADJUSTMENTS		
Idle Mixture Screws (turns open)	1 1/4	1 1/4
Idle Speed (curb idle)	500	500
(Air Conditioning **ON**)	500	500
Fast Idle Speed	700	700
Fast Idle Cam Position	5/16"	17/64"
Bowl Vent (closed throttle)	5/64"	5/64"
Vacuum Kick	15/64"	13/64"
Float Setting	7/32"	7/32"
Choke Unloader	15/64"	15/64"
CHOKE		
Control	Thermostatic Coil Spring	
Type	Well	Well
Setting	On Index	On Index

AFB CABURETOR

CARBURETOR	
Type	4 Barrel Downdraft
Model	AFB-3611S
Engine Displacement	383 Cu. In.
THROTTLE BORE	
Primary	1 7/16"
Secondary	1 9/16"
MAIN VENTURI	
Primary	1 3/16"
Secondary	1 5/16"
MAIN JET	
Primary	.089"
Secondary	.0689"
LOW SPEED JET	
Primary	#65-.035"
STEP-UP ROD (2 Stage)	
Standard	16-216
1 Size Lean	16-165
2 Sizes Lean	16-162
ADJUSTMENTS	
Accelerator Pump (top of plunger to air horn)	7/16"
Choke Unloader	3/8"
Cam Position	13/64"
Fast Idle Speed (r.p.m.)	700
Idle Speed (r.p.m.)	500
(with air conditioning **ON**)	500
Secondary Throttle Lever Adjustment	21/64"
Secondary Throttle Lockout Adjustment	.020"
Float Setting	7/32"
Float Drop	3/4
Idle Mixture (both screws open)	1 1/2 Turns
Vacuum Kick	1/8"
CHOKE	
Control	Coil Spring
Type	Well
Setting	On Index

SPECIAL TOOLS

T109-22	Bending Tool
T109-28	3/16" Gauge, Vacuum Kick
T109-29	.020" Wire Gauge, Secondary Throttle Lever
T109-31	1/4" Gauge, Fast Idle Cam Position and Choke Unloader
T109-32	15/64" Gauge, Vacuum Kick (Manual) Choke Unloader
T109-35	1/8" Gauge, Vacuum Kick (Auto. Trans.)
T109-36	1/8" Gauge, Vacuum Kick Adjustment
T109-39	13/64" Gauge, Vacuum Kick (Automatic)
T109-41	Bending Tool, Fast Idle and Unloader
T109-43	Plug Remover, (Pump Jet)
T109-58	Screw Driver Bit
T109-59	Screw Driver Bit
T109-59T	Screw Driver Bit, (Accelerator Pump Jet)
T109-80	3/8" Gauge, Unloader
T109-106	7/32" Float Gauge
T109-107	5/16" Gauge, Fast Idle Cam (Manual)
T109-166	11/64" Gauge, Vacuum Kick (Manual Trans.)
T109-213	Bending Tool
T109-214	Bending Tool
T109-220	5/16" Gauge, Float (Taxi)
T109-238	17/64" Gauge, Fast Idle Cam (Automatic)
T109-282	1/4" Gauge, Float
T109-287S	Elevating Legs
73519	Float Gauge (7/32")
73598	Plug, Remover and Installer
73605	Bending Tool (Float Lip)
73606	Jet Remover and Installer (Main Metering)
73608	Jet Remover and Installer (Discharge)
73609	Socket Handle
C-3225	Stand—Carburetor Repair
C-3400	Stand—Carburetor Repair
C-3748	Main Jet Removing and Installing
C-3886	Stand—Carburetor Repair
C-3903	Gauge—Float
1/16" Drill	Bowl Vent
No. 6 Drill	Vacuum Kick, (Manual Trans.) 225 cu. in. T109-39 (13/64)
No. 13 Drill	Vacuum Kick (Manual Trans.) 170 cu. in. T109-28 (3/16)
No. 18 Drill	Vacuum Kick (Auto. Trans.) 170 cu. in. T109-166 (11/64)
No. 23 Drill	Vacuum Kick (Auto. Trans.) 225 cu. in. T109-154 (5/32)

FUEL SYSTEM

The fuel system consists of the fuel tank, fuel pump, fuel filter, carburetor, fuel lines and vacuuum line (See Fig. 1).

The fuel tank assembly consists of the tank, filler neck cap, air vent, and a fuel gauge sending unit.

In operation, the fuel pump draws fuel from the tank and forces it to the filter and carburetor. The carburetor meters the fuel into the air stream drawn into the engine in quantities suitable for all engine speed and load conditions.

The fuel filter for all 1964 Plymouth and Valiant Models is a paper element sealed, disposable type unit, located in the fuel line between the fuel pump and the carburetor. The filter unit should be replaced every 16,000 miles, or once each year.

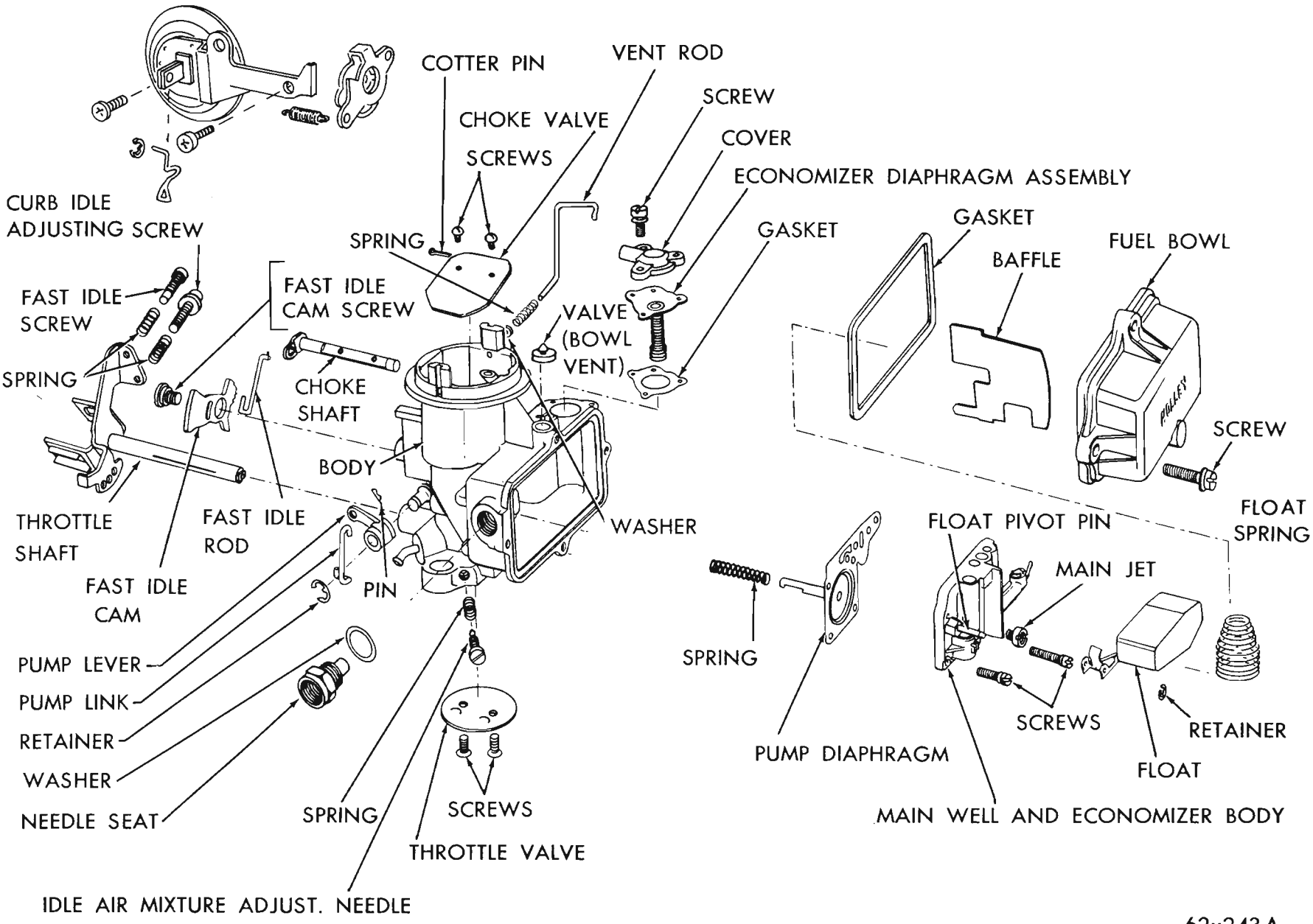


Fig. 3—Carburetor Assembly (Disassembled View)

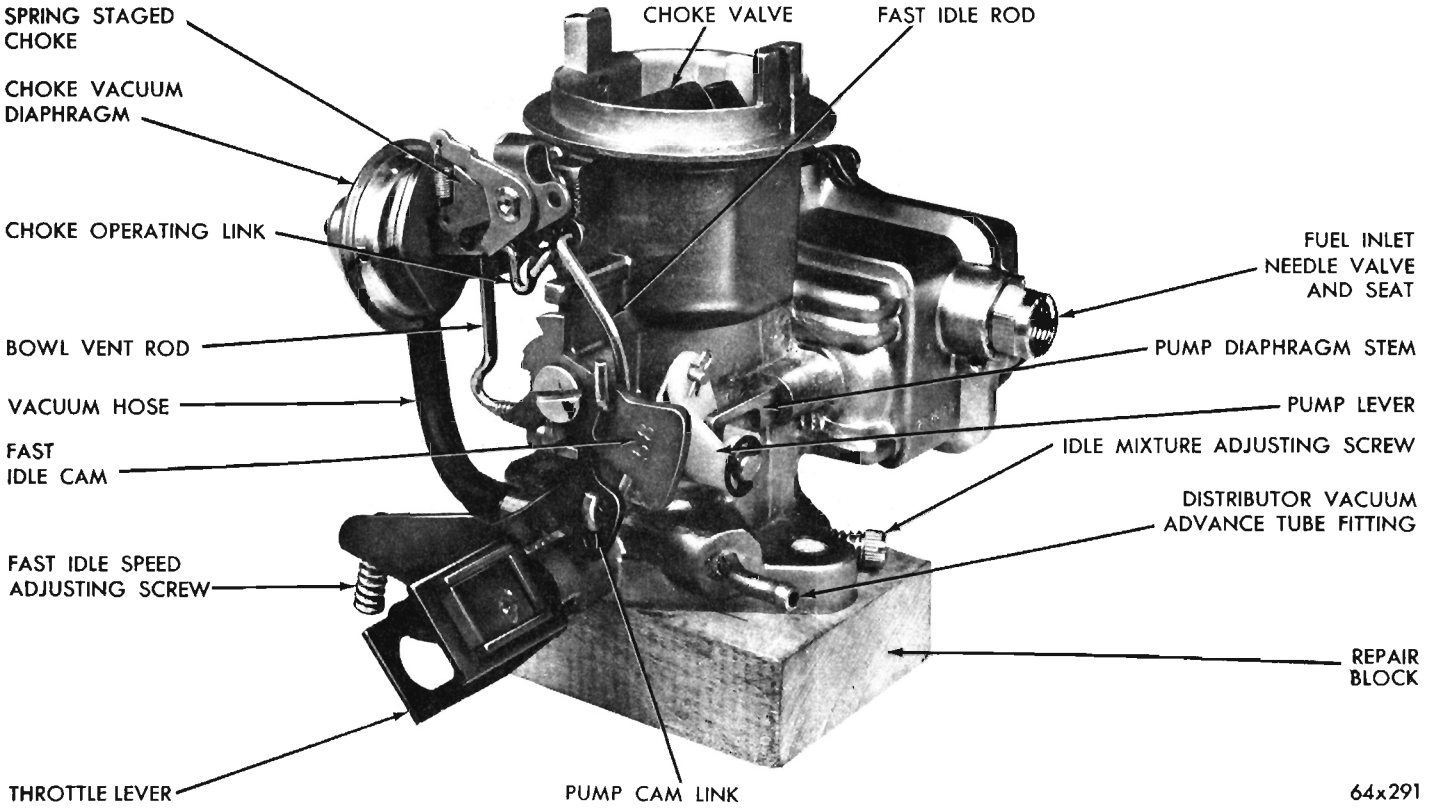


Fig. 1—Carburetor Assembly (R-2765A and R-2766A)

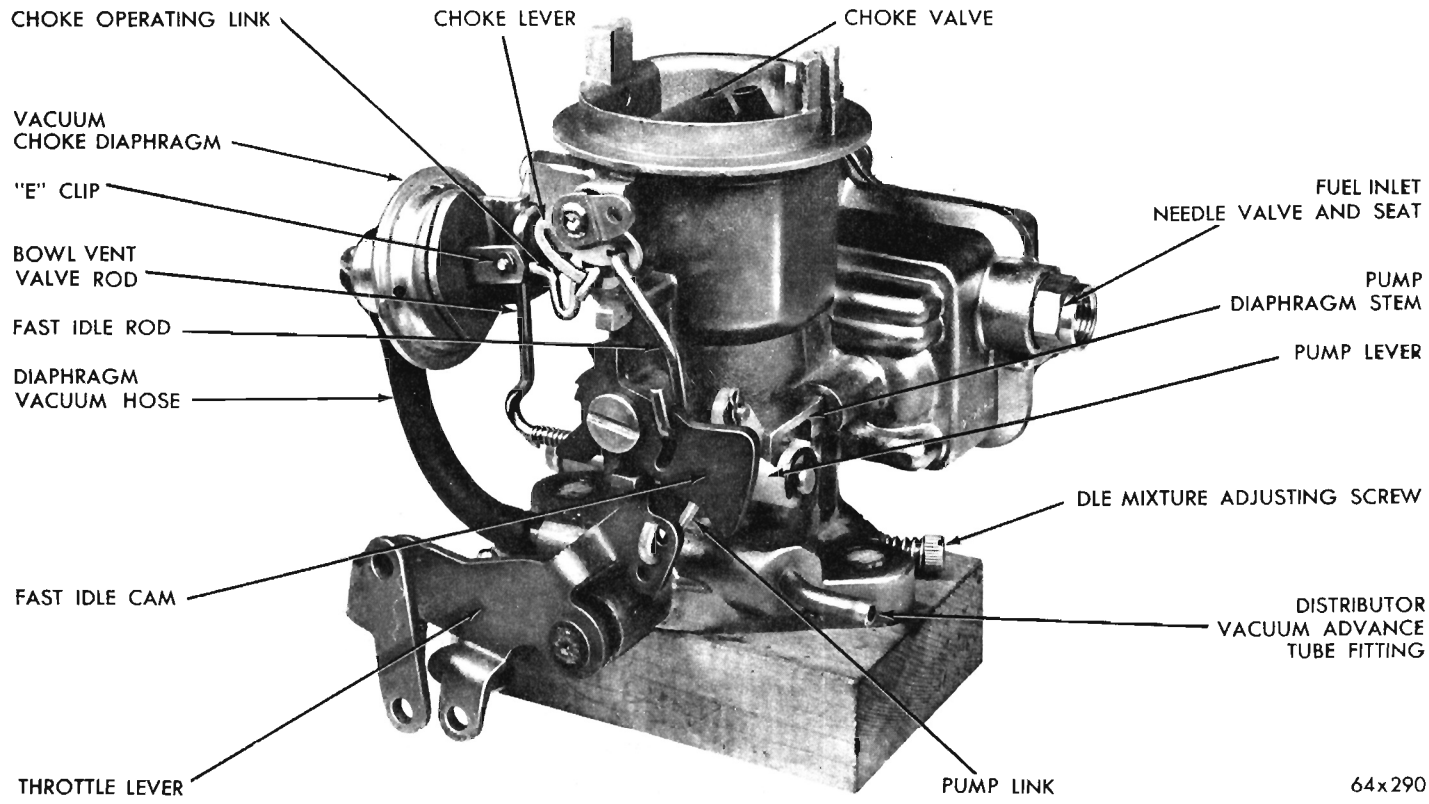


Fig. 2—Carburetor Assembly (R-2769A and R-2770A)

PART 1

HOLLY CARBURETORS

(1920R SERIES)

The Holley carburetors models R-2765A, and R-2766A used on the 170 cubic inch engine, are equipped with a spring staged choke, as shown in Figure 1. Since all the Holley carburetors are serviced in the same manner, the staged choke adjustment will be covered separately and indicated as such in the service procedures.

The Holley carburetors used on the 225 cubic inch engine (high performance) R-2769A and R-2770A, with manual and automatic transmisssions are serviced the same as the previously mentioned carburetors. (Refer to Fig. 2). Since the service procedures are identical on all Holley carburetors, the illustrations showing the various disasssembly procedures will not always show any one specific carburetor.

The spring staged choke, shown in Figure 1 is a device incorporated in the choke mechanism which limits the choke blade closing torque when cranking the engine at temperatures below zero. The spring staging of the choke is suited for the engine's starting mixture requirements at both the low and moderate temperatures.

Fuel from the bowl flows into the four basic fuel metering systems, which are: the idle system, the main metering system, the power enrichment system and the accelerating pump system.

The choke valve located in the bore of the carburetor is connected to a well-type automatic choke.

Additional fuel for acceleration is supplied by a diaphragm type, mechanically operated pump. The pump is operated by a cam connected by linkage to the throttle shaft. An override spring on the pump insures a prolonged discharge of fuel for smoother operation.

A power valve mounted in the metering body, actuated by manifold vacuum, delivers the additional fuel necessary for full power and high speed operation.

The fuel bowl is vented by an external vent valve located in the top of the bowl. The vent valve is connected by linkage to the throttle shaft, so that the valve is opened a prescribed distance when the vehicle is at idle or completely shut down.

When overhauling the carburetor, several items of importance should be observed to assure a good job.

(1) All parts (except the choke diaphragm) should be carefully cleaned in a suitable solvent, then inspected for damage or wear.

(2) Use air pressure only, to clear the various orifices and channels.

(3) Replace questionable parts with new ones. When inspecting parts removed from carburetor, it is at times rather difficult to be sure they are satisfactory for further service. It is, therefore, recommended that in such cases new parts be installed.

(4) Always use a complete repair kit when overhauling the carburetor. Using the code number stamped on the flat surface next to the fast idle adjusting screw, refer to the parts catalogue for the correct repair kit for the carburetor being worked on.

SERVICE PROCEDURES

1. CARBURETOR

Disassembly (Figs. 1, 2 and 3)

(1) Place the carburetor assembly on the repair stand, Tool C-3886.

(2) Remove the vacuum hose between the carburetor throttle body fitting and the vacuum diaphragm.

(3) Remove the "E" clip from the choke operating link and disengage the link from the diaphragm plunger (stem) and the choke lever (Refer to Figure 1 or 2).

(4) Remove the vacuum diaphragm and bracket assembly and place to one side to be cleaned as a separate item. **As the vacuum diaphragm bracket is being removed, the bowl vent valve rod, spring and washer will fall out. Do not lose the spring and flat washer (Refer to Figure 4).**

(5) Using a 5/8" wrench, remove the fuel inlet needle valve and seat.

(6) Remove the economizer retaining screws, then lift economizer cover, diaphragm and stem out of the carburetor, as shown in Figure 5.

(7) Remove the fuel bowl attaching screws, then

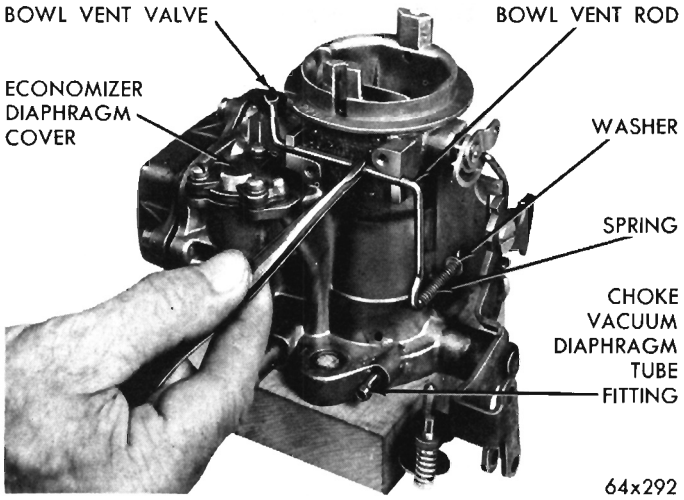


Fig. 4—Removing or Installing Bowl Vent Rod

remove the fuel bowl, baffle and gasket, as shown in Figure 6. Slide the base out of the bowl. Discard the gasket.

(8) Using a suitable tool, remove the float retaining clip, then slide the float off the fulcrum pin.

(9) Remove the screws that attach the economizer body and plugs, then remove the economizer body as shown in Figure 7.

(10) Tilt the pump lever on its pivot until the hook on the pump diaphragm stem can be released. Slide the pump diaphragm and spring out of the fuel bowl (Refer to Fig. 8).

(11) To disassemble the pump diaphragm, compress the spacer slightly toward the diaphragm until the ball drops out. Slide spacer and spring off the diaphragm stem, as shown in Figure 8.

(12) Using Tool C-3748, remove the main jet from the economizer body (See Fig. 9).

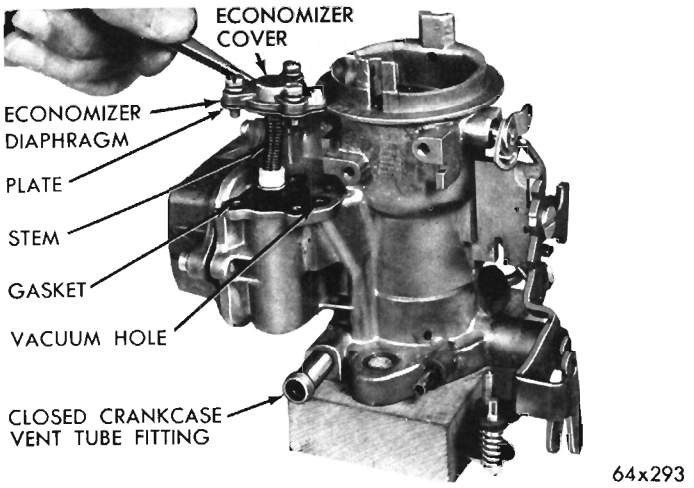


Fig. 5—Removing or Installing the Economizer

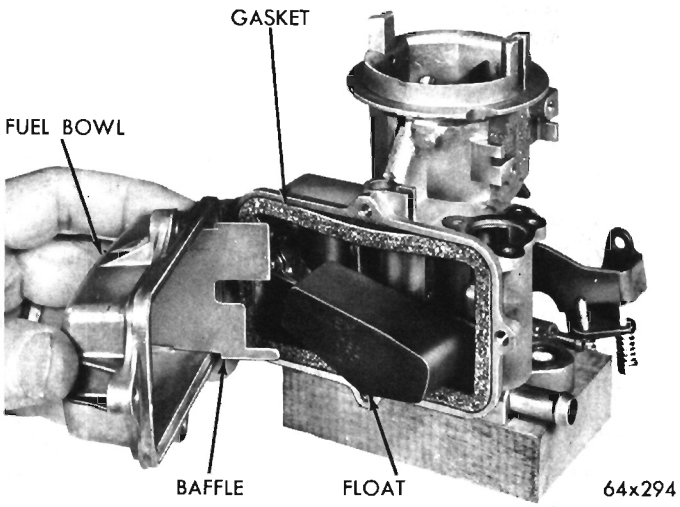


Fig. 6—Removing or Installing the Fuel Bowl

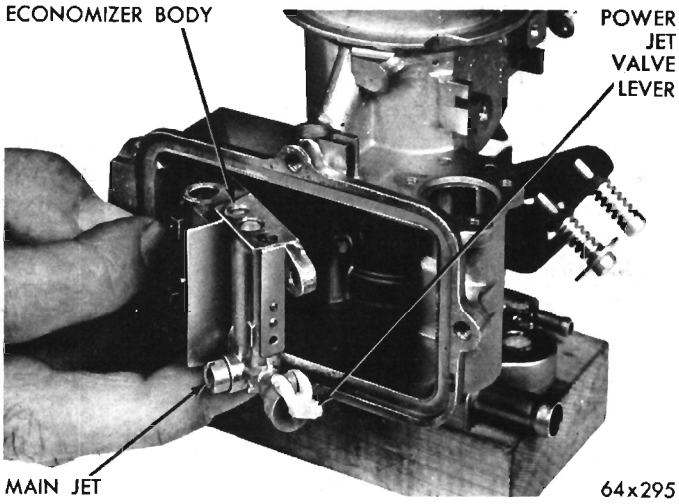


Fig. 7—Removing or Installing Economizer Body

(13) Using a suitable tool, remove the pump cam retaining clip. Slide the cam off the pivot and disengage the link from the throttle lever.

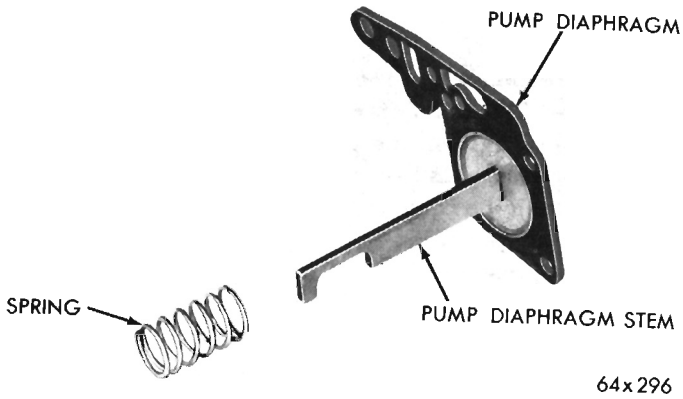


Fig. 8—Pump Diaphragm and Spring

(14) Remove the fast idle cam retaining screw, then remove the cam, and at the same time, disengage the choke link.

(15) Remove the idle air mixture adjusting screw and spring from the throttle flange.

(16) Remove the fast idle and curb idle speed screws and springs from the throttle lever.

(17) Invert the carburetor and remove the bowl vent operating lever and dog retaining screw, then remove the lever and dog from the end of the throttle shaft.

(18) Remove the screws that hold the choke valve to the choke shaft.

CAUTION: These screws are staked to prevent loosening, and extreme care is necessary, to avoid breaking off in the choke shaft.

(18) Lift out the choke valve. Withdraw the choke shaft and lever out of the carburetor.

The carburetor assembly now has been disassembled as far as necessary for cleaning and inspection. It is usually not advisable to remove the throttle shaft and valve from the throttle flange, unless wear or damage necessitates the installation of new parts.

Cleaning the Carburetor Parts

The recommended solvent for gum deposits is denatured alcohol which is easily obtainable. However, there are other commercial solvents which may be used with satisfactory results.

The choke diaphragm can be damaged by solvents. Avoid placing the diaphragm assembly in **ANY** liquid. Clean the external surfaces with a clean cloth or a soft wire brush. Shake dirt or other foreign material from the stem side of the diaphragm. Depressing the diaphragm plunger (stem) to the retracted position, will provide an additional hole for the removal of dirt. Compressed air can be used to remove loose dirt **but should not be connected to the vacuum inlet fitting.**

IMPORTANT: If the commercial solvent or cleaner recommends the use of water as a rinse, it should be "HOT". After rinsing, all trace of water must be blown from the passages with air pressure. It is further advisable to rinse all parts in clean kerosene or gasoline to be certain no trace of moisture remains. Never clean jets with a wire, drill, or other mechanical means, because the orifices may become enlarged, making the mixture too rich for proper performance.

Inspection and Reassembly— Throttle Body

(1) Inspect the throttle shaft for excessive wear in the throttle body. If wear is extreme, it is recommended that the carburetor assembly be replaced rather than installing a new shaft in the old body.

During manufacture, the location of the idle transfer port and the spark advance control ports to the throttle valve is carefully established for one particular assembly.

If a new shaft should be installed in an old, worn throttle body, it would be very unlikely that the original relationship of the ports to the valve would be obtained. Changing the relationship of the valve to the ports would adversely affect normal car operation between the speeds of 15 and 30 miles per hour. However, if it has been determined that a new shaft or valve is to be installed, adhere to the following instructions:

(2) Mark the position of the throttle valve in the bore.

(3) Remove the screws that hold the throttle valve to the shaft, then slide the valve out of the bore.

CAUTION: These screws are staked on the opposite side and care should be used at removal so as not to break in the shaft.

(4) Slide the throttle shaft out of the throttle body.

(5) Install a new throttle shaft and lever (or new valve).

(6) Install NEW screws but do not tighten. Hold the valve in place, with the fingers pressing on the high side of valve. Tap the valve lightly with a screw driver to seat in the throttle bore. Tighten the screws securely and stake by squeezing with pliers.

(7) Install the idle mixture screw and spring in the throttle body (The tapered portion must be straight and smooth. If the tapered portion is grooved or ridged, a new idle mixture screw should be installed to insure having correct idle mixture control). **Do not use a screw driver.** Turn the screw **lightly** against its seat with the fingers. Back off one full turn for the approximate adjustment.

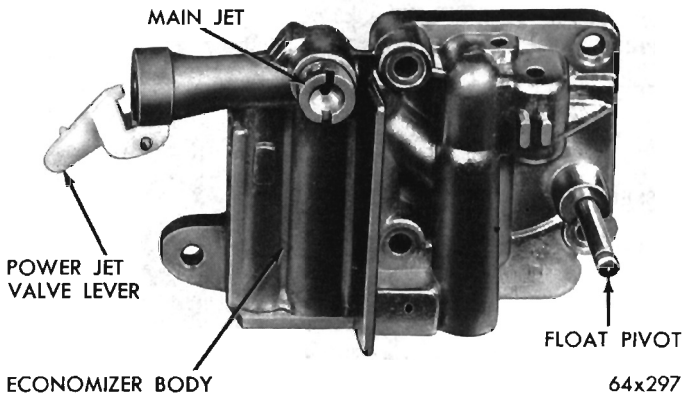


Fig. 9—Economizer Body Assembly

Assembling the Carburetor

(1) Slide the choke shaft into the airhorn, then install the choke valve.

(2) Install the choke valve attaching screw but do not tighten. Hold the valve closed, with the fingers pressing on the high side of the valve. Tap the valve lightly with a screw driver to seat in the airhorn. Tighten the attaching screws securely and stake by squeezing with pliers.

(3) Test the choke valve for binding by rotating the lever through the extent of its full travel.

(4) Install the fast idle and curb idle speed screws and springs in the throttle lever.

(5) Slide the pump spring over the pump diaphragm stem. Install the assembly in position in the fuel bowl and at the same time, engage the hook on the diaphragm stem with the recess in the pump lever (Fig. 8).

(6) Install the main jet in the economizer body, using Tool C-3748 (Refer to Fig. 9).

(7) Turn carburetor with bowl opening up then position the main well and equalizer body in the carburetor, as shown in Figure 7. Install screws and tighten securely. **Be sure the pump spring is correctly centered.**

(8) Engage the pump cam link with the cam and throttle lever, then install cam and secure with clip. When installing the link, be sure link is in the center hole of throttle lever.

(9) Engage the choke link with the choke lever and fast idle cam. Place the cam in position, then install retaining screw. Tighten the screw securely.

(10) Position the bowl vent operating lever and dog on the end of the throttle shaft and secure with the retaining screw.

(11) Slide the float into position over the fulcrum pin and secure with retainer clip.

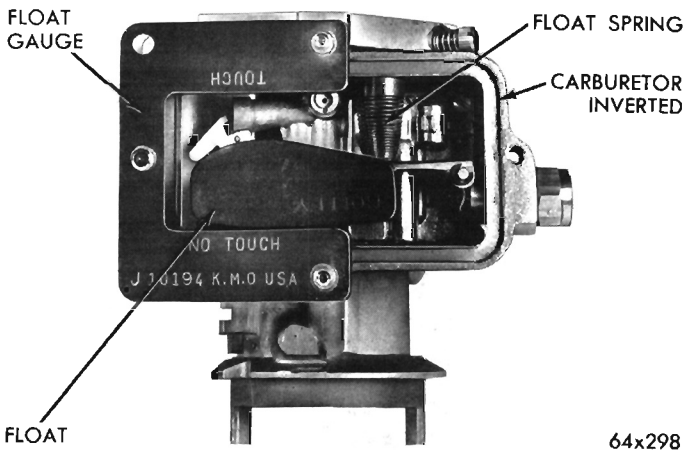


Fig. 10—Measuring the Float Setting

(12) Install the fuel inlet needle, seat and new gasket. Tighten seat securely. Test the float setting as follows:

Measuring the Float Setting

With the carburetor inverted, slide the float gauge into position and test the setting on the "touch" leg of the gauge, as shown in Figure 10. The float should just touch the gauge. Reverse the gauge and test the "No touch" leg. The float should just clear the gauge.

If an adjustment is necessary, bend the float tab (which touches the head of the fuel inlet needle) using needle nose pliers.

NOTE: Do not allow the float tab to contact the float needle head during this operation as the synthetic rubber tip of the needle can be compressed, giving a false setting.

Retest the float setting as described above after adjustment.

(1) Slide the economizer diaphragm and stem assembly into position, making sure the vacuum holes are aligned and that the stem is on the power valve (Refer to Fig. 5). Install the cover and retaining screws. Tighten screws securely.

(2) Slide the baffle into position in the fuel bowl, place the fuel bowl gasket on the cover. Place the fuel bowl in position, install screws and washers and tighten alternately (Be sure gasket is sealed in the recess section of the main body. Tighten the screws gently so as to compress only the lockwasher. Screws drawn down too tightly could distort the fuel bowl and cause a leak).

(3) Slide the bowl vent rod down into position at the same time thread the spring over the rod. Secure with clip (Refer to Fig. 4).

Installing the Vacuum Diaphragm

(1) Slide the bowl vent rod return spring and washer over the end of the rod, then install in position on the airhorn. Hold the rod centered in its grooves, using a finger.

(2) Install the vacuum diaphragm assembly on the airhorn, being sure the vent rod is in position. Install the diaphragm attaching screws and tighten securely.

(3) Install the choke operating link in position between the diaphragm plunger (stem) and the choke lever. Install the "E" clip to secure.

(4) Inspect the vacuum diaphragm fitting and remove any dirt or foreign material which could plug the vacuum passage. Inspect the rubber hose for cracks, before placing it on the correct fitting (Refer to Fig. 1.)

Do not connect the vacuum hose to the diaphragm fitting until after the vacuum kick adjustment has

been made (See Carburetor Adjustments).

2. CARBURETOR ADJUSTMENTS

It is very important that the following adjustments be made on a reconditioned carbuetor and in the sequence listed.

Fast Idle Speed and Cam Position Adjustment

NOTE: The cam position adjustment is only performed on the non-spring staged choke carburetors.

The fast idle engine speed adjustment should be made on the vehicle, as described in the Paragraph Fast Idle Speed Adjustment. However, the Fast Idle Cam Position Adjustment can be made on the bench as follows:

(1) With the fast idle speed adjusting screw contacting the lowest step on the fast idle cam, as shown in Figure 11, move the choke valve toward the closed position with light pressure. Insert a $^{15}/_{64}$ inch drill or gauge between the choke valve and the wall of the air horn.

(2) An adjustment will be necessary if a slight drag is not obtained as the drill or gauge is being removed.

(3) If an adjustment is necessary, bend the fast idle rod, using Tool T109-213, until the correct valve opening has been obtained (Refer to Fig. 11).

NOTE: When the correct fast idle position cam adjustment has been made, the choke unloader (wide open kick) adjustment has also been obtained. No further adjustment is required.

Vacuum Kick Adjustment—(This test can be made **On** or **Off** the Vehicle).

To make the vacuum kick adjustment, the vacuum diaphragm must be energized (either a distributor testing machine with a vacuum source, or vacuum supplied by another vehicle).

(1) With the engine **Not** running, open the throttle valve far enough to allow the choke valve to be moved to the closed position.

(2) Disconnect the vacuum hose from the diaphragm and connect the hose from the vacuum supply, as shown in Figure 12. (A minimum of 10 inches of mercury (HG) will be required.)

(3) Insert a number 13 drill (170 cu. in. engine, manual transmission, or a T109-28 $^{3}/_{16}$ inch) gauge between the choke valve and the wall of the airhorn or a No. 18 drill (170 cu. in. engine, automatic transmission) or a T109-166 $^{11}/_{64}$ inch) gauge in the above location. Use a No. 6 drill or gauge T109-39 ($^{13}/_{64}$ inch) on the 225 cu. in. engine (manual transmission) or a No. 23 drill or gauge T109-154 ($^{5}/_{32}$inch) on the 225 cu. in. engine (automatic transmission), as above (Refer to Fig. 12). Apply a slight closing pressure on the choke valve, as shown.

(4) An adjustment will be necessary, if a slight drag is not obtained as the drill or gauge is being removed.

The adjustment of this opening will require the removal of the choke operating link.

CAUTION: Damage to the diaphragm and the choke lever slot can result, if the link is not removed for the bending operation.

(5) Remove the "E" clip and disengage the choke operating link from the diaphragm stem (plunger), then disengage the link from the choke lever (The best bending results will be obtained by using a vise and a pair of pliers).

(6) Bend the choke operating link at the angle to provide the correct choke valve opening.

CAUTION: A correction in the length of the link of .010 inch, will result in a change of .010 inch in the choke valve opening.

As an example, if the choke valve opening is .010 inch error, the correction in the link length would be .010 inch.

A "2" inch micrometer will be helpful in establishing the original length of the link, as shown in Figure 13, before completing the adjustment.

(7) Install the choke operating link and retest the choke valve opening, using a gauge or drill (Refer to Fig. 13.)

Reinstall the vacuum hose to the diaphragm fitting and make the following test:

(8) With no vacuum applied to the diaphragm, some clearance should exist between the choke operating link and the choke lever slot, in both the open and closed choke valve positions, as shown in Figure 14.

NOTE: This clearance is necessary to allow the choke valve to close for starting and to fully open,

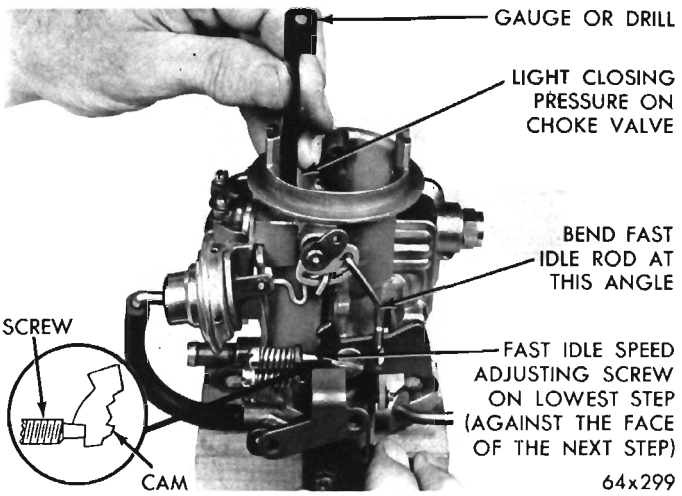


Fig. 11—Fast Idle Cam Position Adjustment

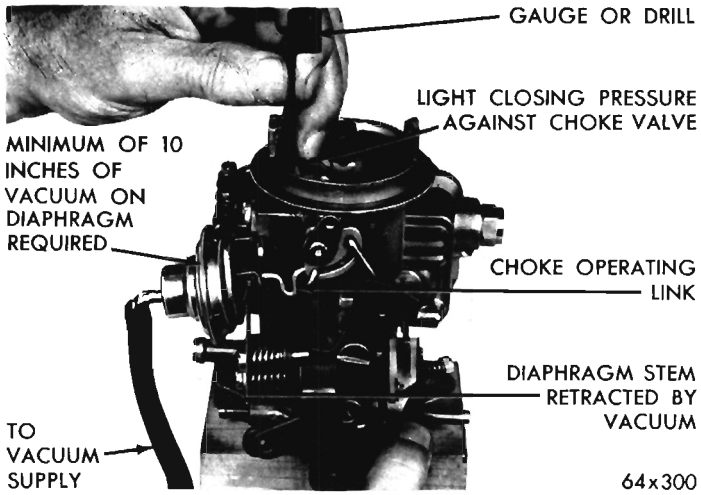


Fig. 12—Measuring the Choke Vacuum Kick Setting

after the engine reaches the normal operating temperature.

If a clearance does not exist in both of these positions, a retest of the operating link adjustment should be made.

NOTE: Free movement of the choke valve between the closed and open positions is very necessary.

This free movement should also exist between the kick and the open choke valve positions with the engine running. If binding does exist, the choke operating link has been improperly bent and should be corrected.

Idle Speed Adjustment (Curb Idle)

To make the idle speed adjustment, the engine must be thoroughly warmed up. A much more reliable idle adjustment can usually be obtained if the vehicle has been driven a minimum of five miles. For the best results, it is recommended that a tachometer be used in this adjustment (Before making the idle speed adjustment, observe the following precautions).

Because the alternator can charge at idle speeds and impose a load on the engine, the Headlamps should be turned **on** the high beam. This will assure setting the idle to compensate for the alternator load. On vehicles equipped with automatic transmission, unsnap the ball joint connection at the accelerator shaft bell crank. If this is not done, it is possible that the carburetor throttle will be held open against the stop in the transmission. The carburetor would therefore not respond to adjustment of the idle speed screw. After the proper idle speed has been obtained at the carburetor, screw the ball joint connector up or down until the ball on the bell crank will exactly mate with the socket. Snap into place.

To make the idle speed adjustment, proceed as follows:

(1) Turn the idle speed screw **in** or **out** to obtain 550 rpm (Be sure that the choke valve is fully open and that the fast idle adjusting screw is not contacting the cam).

(2) Adjust the idle mixture screw to obtain the highest rpm. While making the adjustment, carefully watch the tachometer and notice that the speed can be decreased by turning the screw in either direction from the setting that gave the highest rpm reading.

(3) From the highest idle speed setting, turn the mixture screw clockwise (leaner) until the speed starts to drop. Turn the screw in the opposite direction (counter-clockwise) just far enough to recover the speed that was lost.

This procedure will assure that the idle has been set to the leanest mixture possible for smooth idle. **This setting is very important.**

Since the correct speed was originally set using the fast idle speed screw, the speed obtained after finding the leanest smooth idle setting will probably be too fast.

(4) Readjust the speed screw to obtain correct idle speed. Repeat steps 2 and 3 above.

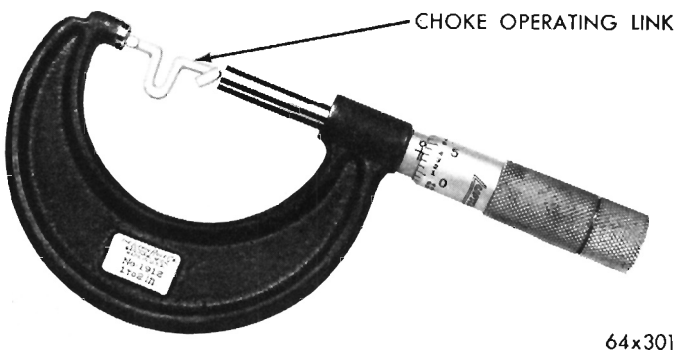


Fig. 13—Choke Operating Link Measurements

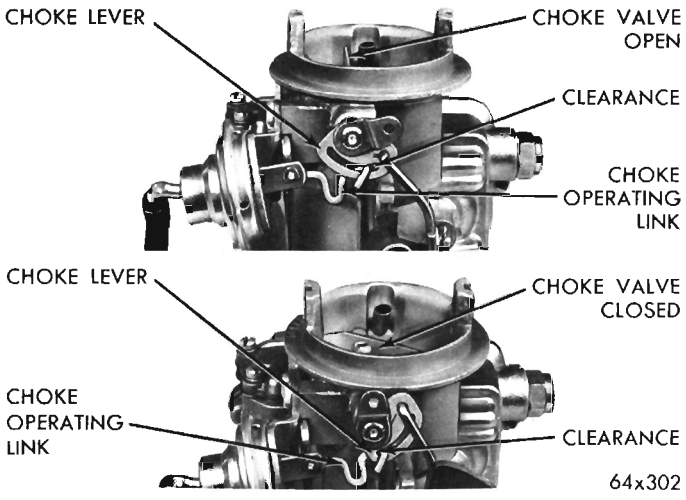


Fig. 14—Choke Operating Link Clearances

Fast Idle Speed Adjustment (On the Vehicle)

To set the fast idle speed on the car, connect a tachometer to the vehicle, then set the curb idle speed and proceed as follows:

(1) With the engine running and the transmission in the neutral position, open the throttle slightly.

(2) Close the choke valve about 20 degrees then allow the throttle to close. Return the choke valve to the open position.

(3) The fast idle speed adjusting screw should contact the lowest step on the fast idle cam, as shown in Figure 15.

(4) With the engine warmed-up to the normal operating temperature, turn the fast idle speed adjusting screw **in** or **out** to secure 700 rpm. **Reposition the cam and throttle after every screw adjustment.**

Wet Fuel Level

With the engine running and the vehicle on a level floor, the fuel level can be measured through the economizer diaphragm opening. Using a 6″ scale with a depth gauge, measure the distance from the machined surface of the opening to the exact fuel surface, as shown in Figure 16. The measurement should be $^{1}1/_{16}$.

Bowl Vent Adjustment

With the throttle valve at curb idle speed, it should be possible to insert a 1/16″ (.0625″) drill between the bowl vent and the seat, as shown in Figure 17. This measurement should never exceed .090 inch (3/32″ drill).

If an adjustment is necessary, bend the tab on the operating arm until the correct clearance has been obtained or bend the vent rod at the horizontal portion above bowl. Be sure the vent rod does not bind in the guide after adjusting.

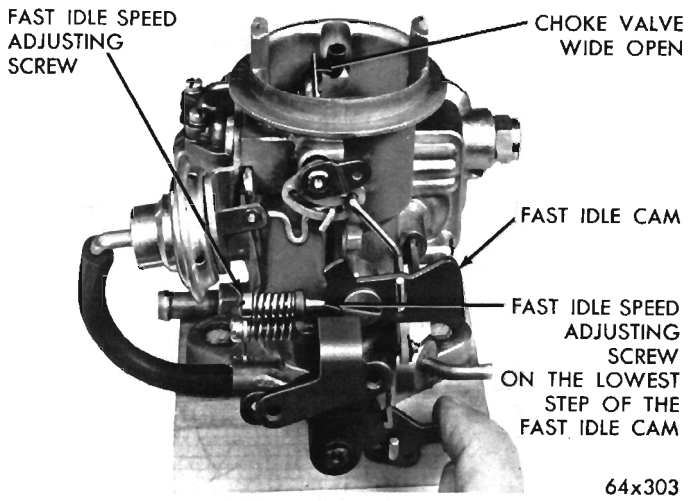


Fig. 15—Fast Idle Speed Adjustment (On the Vehicle)

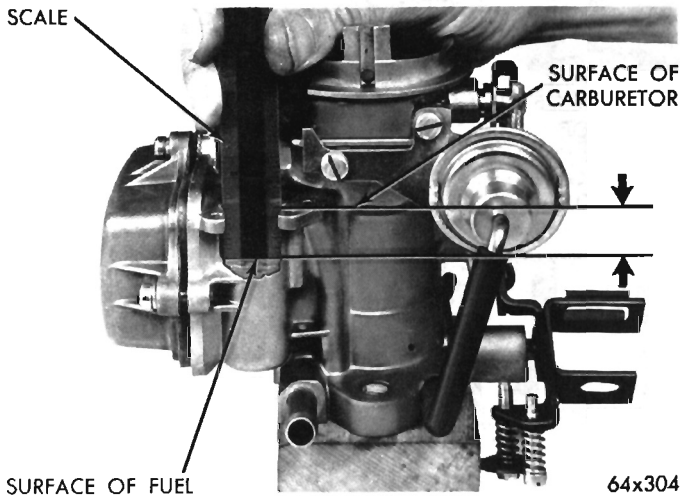


Fig. 16—Measuring the Wet Fuel Level

3. AUTOMATIC CHOKE—WELL TYPE

To function properly, it is important that all parts be clean and move freely. Other than an occasional cleaning, the choke requires no servicing. However, it is very important that the choke control unit work freely in the well and at the choke shaft. Move the choke rod up and down to check for free movement on the pivot. If the unit binds, a new choke unit should be installed.

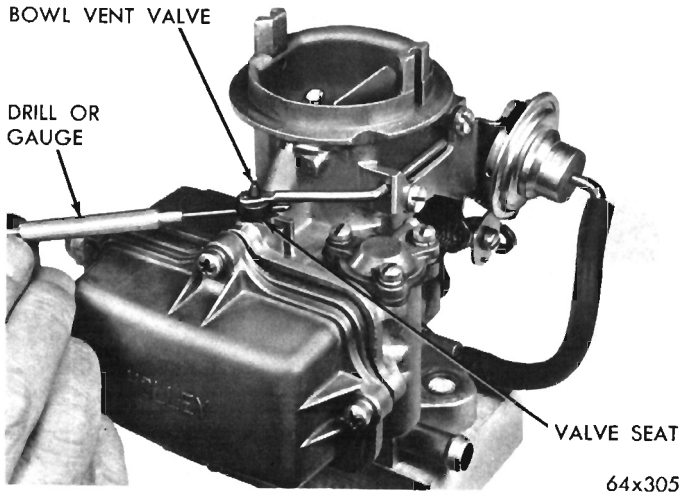


Fig. 17—Measuring the Bowl Vent Opening

NOTE: The well type choke unit, is serviced as an assembly. Do not attempt to repair, or change the setting.

When installing the well type choke unit, be certain that the coil housing does not contact the sides of the well in the exhaust manifold. Any contact at this point will affect choke operation. DO NOT lubricate any parts of the choke or the control unit. This causes an accumulation of dirt which will result in binding of the mechanism.

Spring Staged Choke Adjustment

The following steps are required to test this adjustment:

(1) Press against the choke lever firmly.

(2) Measure the clearance between the hub lever and the shaft lever, as shown in Figure 18.

(3) The clearance in this position, should be from .010 to .025 inches.

(4) If an adjustment is necessary, bend the fast idle rod slightly, using Tool T109-213, until the correct clearance has been obtained. (The cam position and unloader setting resulting from such bending of the choke link are satisfactory.)

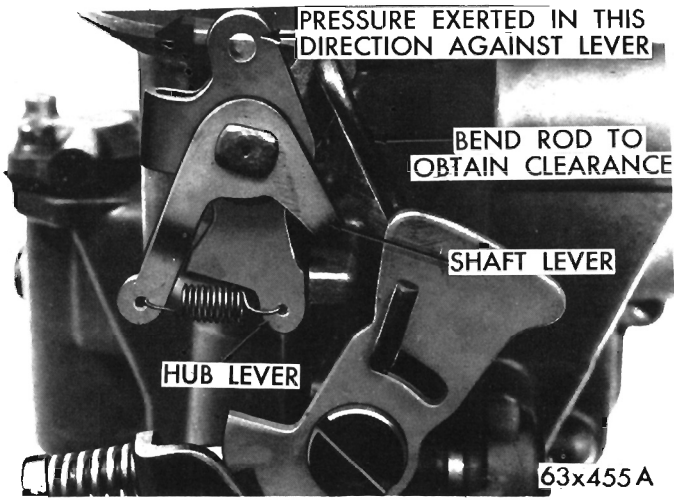


Fig. 18—Spring Staged Choke Adjustment

4. CLOSED CRANKCASE VENT SYSTEM

The closed crankcase ventilator valve is located in the crankcase vent tube cap and is connected to the carburetor throttle body through a rubber tube.

The function of the valve is to control the unburned fuels that originate in the crankcase. The gases are returned to the intake manifold, fed back into the combustion chambers and then expelled out through the exhaust system as completely burned products.

For service procedures of this system, refer to Group 9, "Engine".

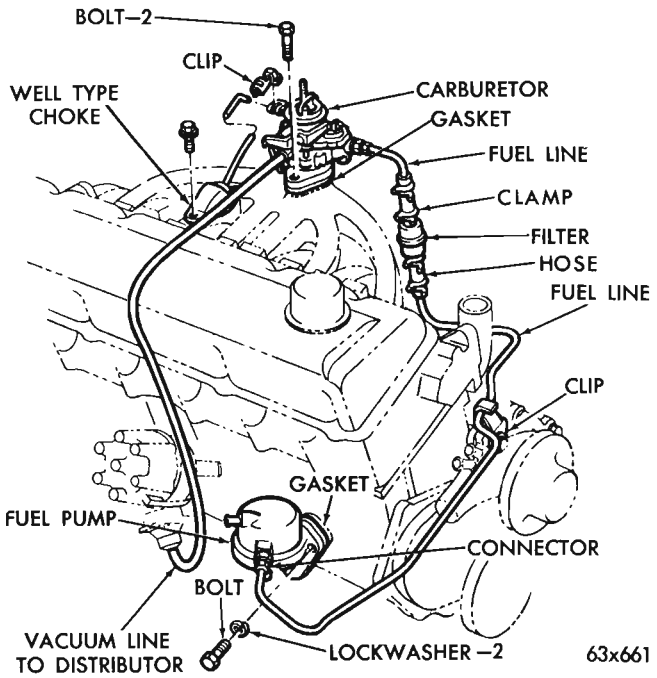


Fig. 1—Fuel System (Engine Compartment)

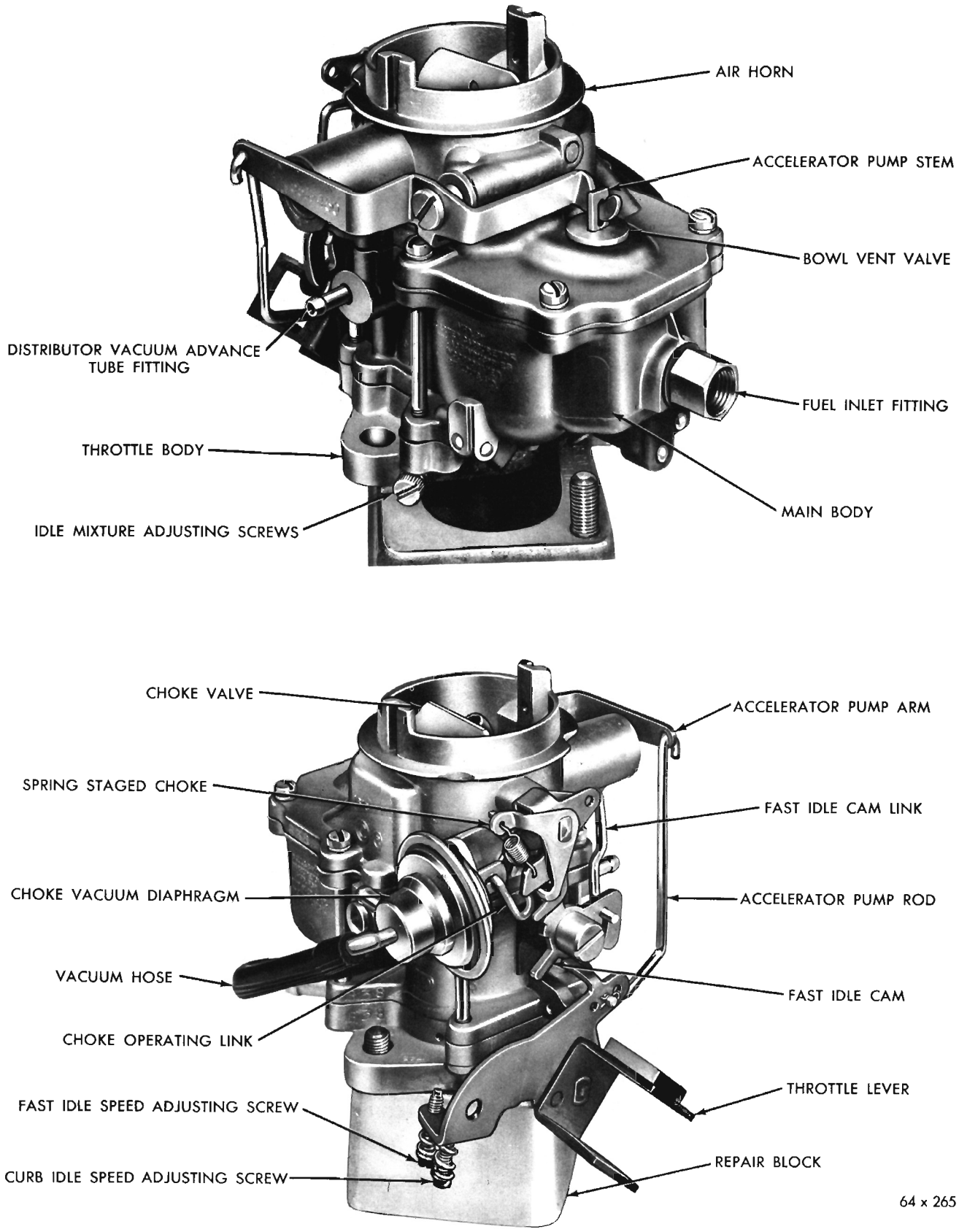


Fig. 1—Carburetor Assembly (BBS 3675, 3676, 3681S)

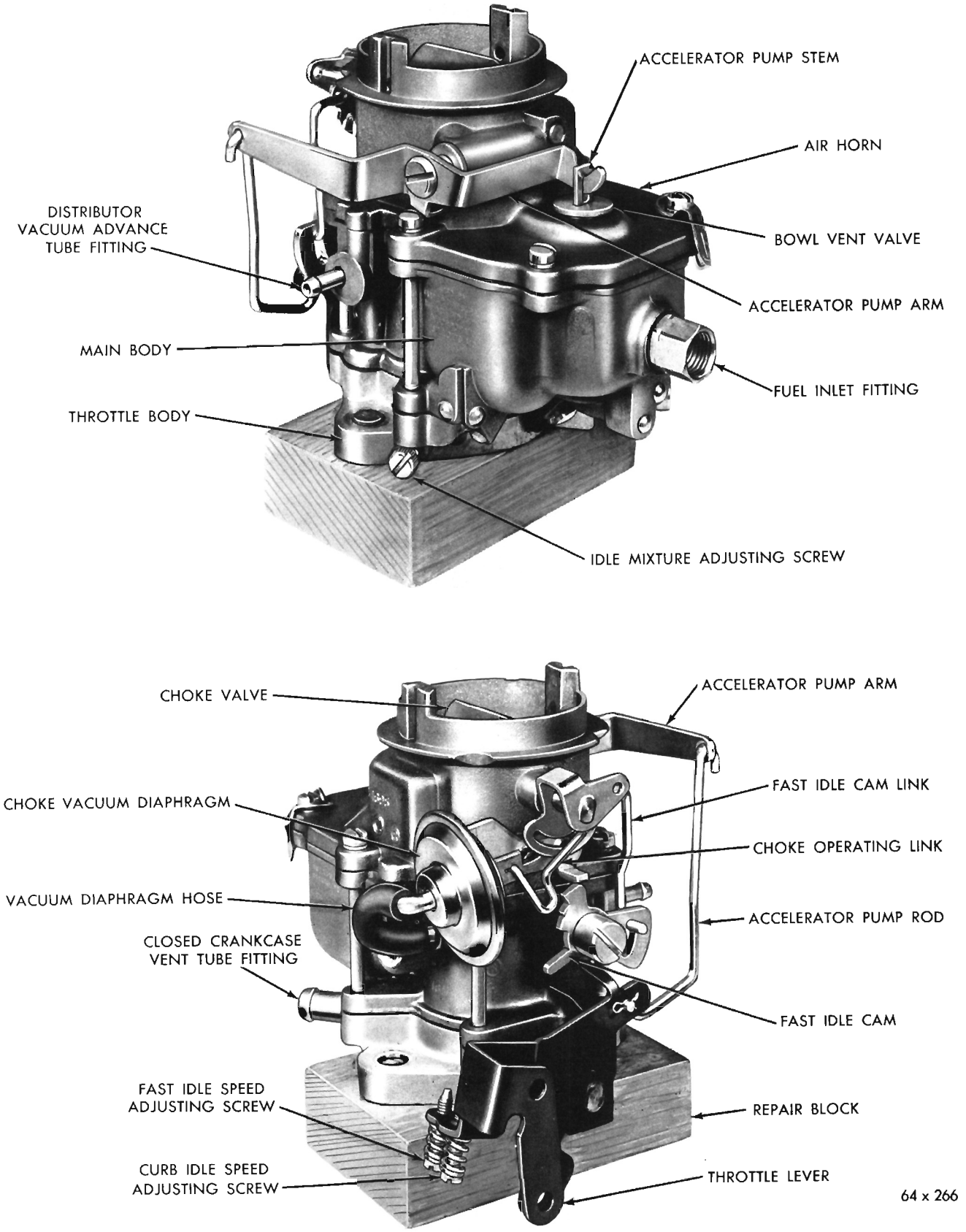


Fig. 2—Carburetor Assembly (BBS 3677, 3679, 3680, 3664S)

PART 2

BBS SERIES CARBURETOR

The BBS 3675S and the BBS 3676S carburetors are single downdraft carburetors used on the 170 cu. in. engine are equipped with a spring staged choke as shown in Figure 1. Since all the BBS carburetors are serviced in the same manner, the staged choke adjustment will be covered separately and indicated as such in the service procedures. The BBS 3679S and the BBS 3680S carburetors used on the 225 cu. in. engine are equipped with a spring staged choke, mechanism, but have the cable control throttle lever, as shown in Figure 2.

The BBS 3681S and the BBS 3664S carburetors used on the 170/225 cu. in. engine (taxi application) and the BBS 3677S and the BBS 3678S used on the 225 cu. in. engine (High Performance) with manual and automatic transmission are serviced the same as the previously mentioned BBS carburetors.

Since the service procedures are identical on all BBS carburetors, the illustrations showing the various disassembly will not always show any one specific carburetor.

The spring staged choke, shown in Figure 1 incorporates the choke mechanism which limits the choke blade closing torque when cranking the engine at temperatures below zero. Thus the spring staging of the choke is necessary for the engine's starting mixture requirements at the low temperatures.

SERVICE PROCEDURES

1. CARBURETOR

Disassembly (Figs. 1 and 2)

(1) Place the carburetor assembly on the repair block, Tool C-3225.

(2) Remove the hairpin clip and disengage the accelerator pump operating rod.

(3) Remove the vacuum hose between the carburetor main body and the vacuum diaphragm.

(4) Remove the clip from the choke operating link and disengage the link from the diaphragm plunger (stem) and the choke lever (Refer to Fig. 1).

(5) Remove the vacuum diaphragm and bracket assembly and place to one side to be cleaned as a separate item. **A liquid cleaner may damage the diaphragm material.**

(7) Tilt the air horn toward the throttle lever far enough to disengage the fast idle cam link from the fast idle cam, as shown in Figure 3. Lift the airhorn up and away from the main body. Discard the gasket.

(8) Disengage the accelerator pump plunger from the rocker arm by pushing up on the bottom of plunger and sliding the plunger shaft off the hook. Slide the plunger out of the airhorn and remove the

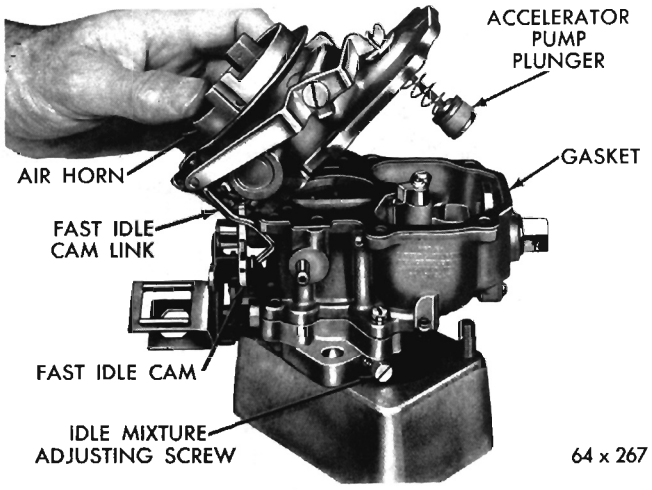


Fig. 3—Removing or Installing the Air Horn

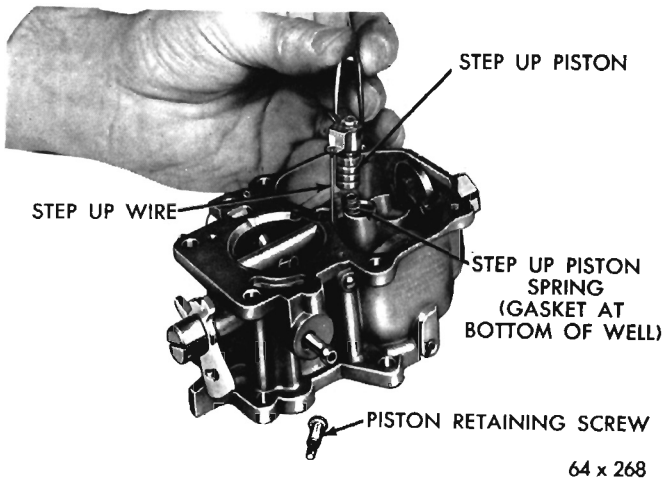


Fig. 4—Removing or Installing Step-Up Piston

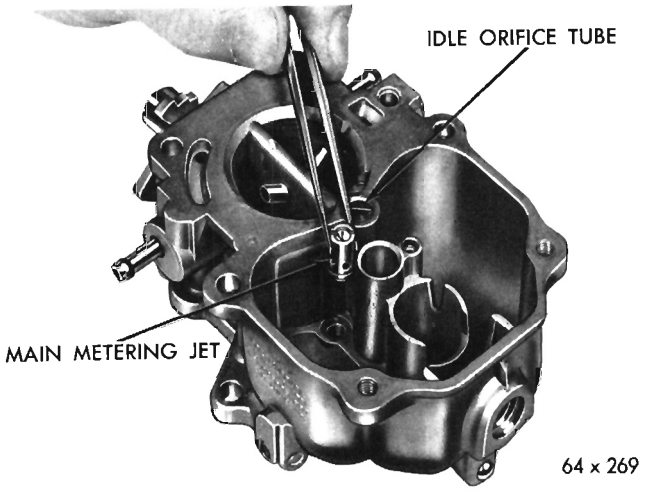


Fig. 5—Removing or Installing Main Metering Jet

bowl vent valve, spring seat and spring. If the old plunger can be used again, or if a new plunger is to be installed, place the plunger in a jar of clean gasoline or kerosene to prevent the leather from drying out.

(9) Lift out the float fulcrum pin retainer, then lift out the floats and fulcrum pin.

(10) Remove the fuel inlet needle valve, seat and gasket from the main body.

(11) Remove the step-up piston retaining screw, and slide the step-up and rod out of the well, as shown in Figure 4. Now lift out the step-up piston spring. Remove the step-up piston gasket from the bottom of the well.

(12) Remove the main metering jet and gasket, as shown in Figure 5.

(13) Unscrew and remove the idle orifice tube, as shown in Figure 6.

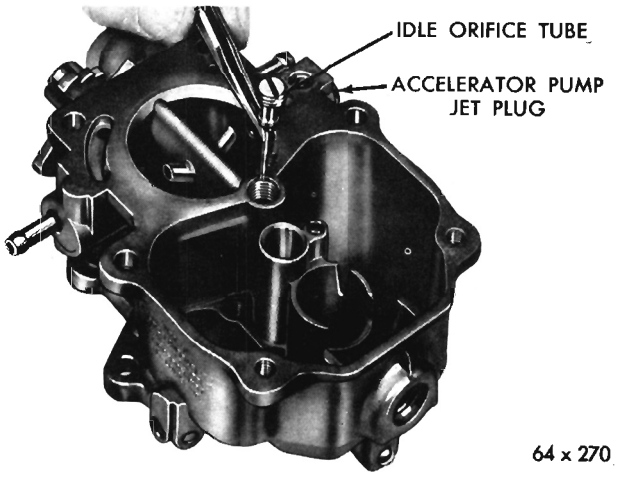


Fig. 6—Removing or Installing Idle Orifice Tube

(14) Invert the carburetor and drop out the accelerator pump check balls from their respective seats.

(15) Using Tool T109-43 plug remover, remove the accelerator pump jet plug. Using Tool T109-59, remove the accelerator pump jet, as shown in Figure 7.

(16) Unscrew and remove the idle mixture adjusting screw and spring.

The carburetor now has been disassembled into three main units, namely, the air horn, main body and throttle body and the component parts of each disassembled as far as necessary for cleaning and inspection.

It is usually not advisable to remove the throttle shaft or valve from the throttle body, unless wear or damage necessitates the installation of new parts.

Cleaning the Carburetor Parts

The recommended solvent for gum deposits is denatured alcohol which is easily obtainable. However, there are other commercial solvents which may be used with satisfactory results.

The choke diaphragm can be damaged by solvents. Avoid placing the diaphragm assembly in **ANY** liquid. Clean the external surfaces with a clean cloth or soft wire brush. Shake dirt or other foreign material from the stem side of the diaphragm. Depressing the diaphragm stem (plunger) to the retracted position, will provide an additional hole for the removal of dirt. Compressed air can be used to remove loose dirt **but should not be connected to the vacuum diaphragm fitting.**

IMPORTANT: If the commercial solvent or cleaner recommends the use of water as a rinse, it should be "HOT". After rinsing, all trace of water must be blown from the passages with air pressure. It is further advisable to rinse all parts in clean kero-

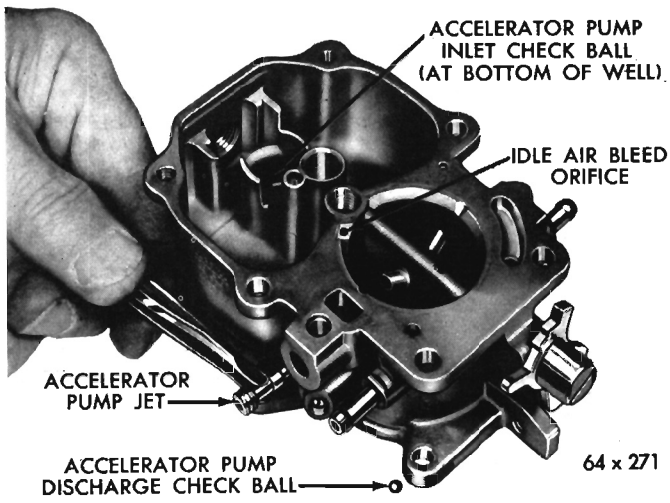


Fig. 7—Removing or Installing Accelerator Pump Jet

sene or gasoline to be certain no trace of moisture remains. Never clean jets with a wire, drill, or other mechanical means, because the orifices may be come enlarged, marking the mixture too rich for proper performance.

Inspection and Reassembly
Throttle Body

(1) Inspect the throttle shaft for excessive wear in the throttle body. If wear is extreme, it is recommended that the throttle body assembly be replaced rather than installing a new shaft in the old body.

During manufacture, the location of the idle transfer port and the spark advance control ports to the throttle valve is carefully established for one particular assembly (See Fig. 8).

If a new shaft should be installed in an old worn throttle body, it would be very likely that the original relationship of the ports to the valve would be obtained. Changing the relationship of the valve to the ports would adversely affect normal car operation between the speeds of 15 and 30 miles per hour. However, if it has been determined that a new shaft or valve is to be installed, adhere to the following instructions:

(2) Mark the position of the throttle valve in the bore, so that it can be reinstalled in the same position.

(3) Remove the screws that hold the throttle valve to the shaft, then slide the valve out of the bore.

CAUTION: These screws are staked on the opposite side and care should be used at removal so as not to break off in the shaft.

(4) Slide the throttle shaft out of the throttle body.

(5) Install a new throttle shaft and lever (or new valve).

(6) Install NEW screws but do not tighten. Hold the valve in place, with the fingers pressing on the high side of valve. Tap the valve lightly with a screw

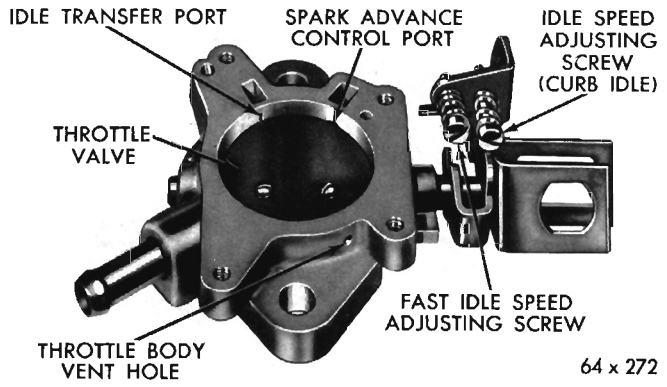


Fig. 8—Ports in Relation to Throttle Valve

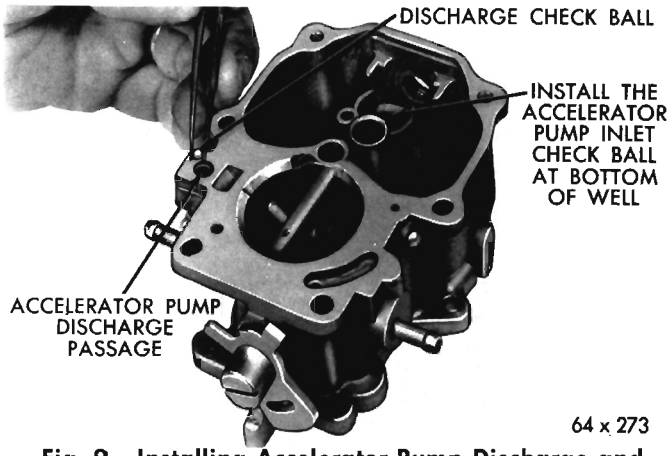


Fig. 9—Installing Accelerator Pump Discharge and Intake Check Balls

driver to seat in the throttle bore. Tighten the screws securely and stake by squeezing with pliers.

(7) Install the idle mixture screw and spring in the throttle body (The tapered position must be straight and smooth. If the tapered portion is grooved or ridged, a new idle mixture screw should be installed to insure having correct idle mixture control). **Do not use a screw driver.** Turn the screw **lightly** against its seat with the fingers. Back off 1 full turn for approximate adjustment.

Main Body

(1) Install the accelerator pump discharge and intake check balls in their respective passages, as shown in Figure 9.

(2) To test the accelerator pump system; fuel inlet and discharge check balls pour gasoline into the carburetor bowl, approximately ½ inch deep. Remove the pump plunger from the jar of gasoline and slide down into the pump cylinder. Raise the plunger and press lightly on the plunger shaft to expel air from the pump passage.

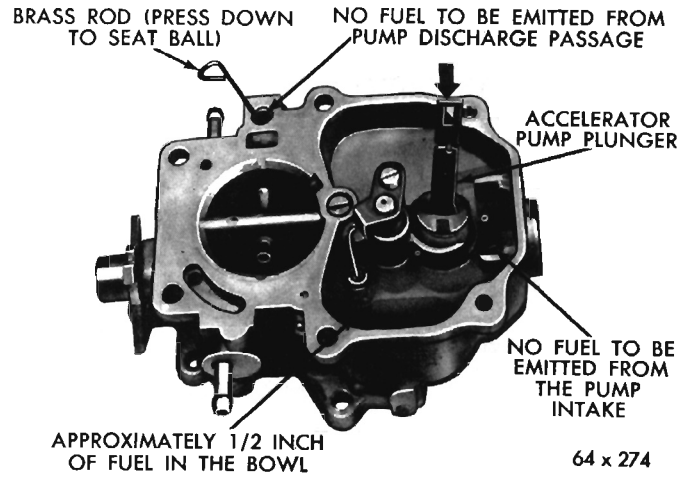


Fig. 10—Testing Accelerator Pump Intake and Discharge Check Balls

(3) Using a small clean brass rod, hold the discharge check ball down firmly on its seat. Again raise the plunger and press downward. No fuel should be emitted from either the intake or discharge passage, as shown in Figure 10.

If any fuel does emit from either passage, it indicates the presence of dirt or a damaged check ball. Clean the passage again and repeat test. If leakage is still evident, install a NEW check ball. The fuel inlet check ball is located at the bottom of the plunger well.

(4) Install the accelerator pump jet, as shown in Figure 7. Tighten securely, using Tool T109-59T. Install a new plug and drive tightly in place.

(5) Install the idle orifice tube (Refer to Fig. 6). Tighten securely.

(6) Install the main metering jet and gasket (Refer to Fig. 5). Tighten securely.

(7) Before installing the step-up piston, be sure the step-up rod is able to move freely each side of the vertical position, as shown in Figure 11. The step-up rod must be straight and smooth.

(8) Slide the step-up piston gasket down into position in the piston well, then install the step-up piston spring and step-up piston and rod (Refer to Fig. 4). Install the retaining screw and tighten securely. Carefully guide the step-up into the main metering jet. Be sure the step-up piston slides freely in its cylinder. A step-up piston stuck in the **UP** position will cause a rich mixture at part throttle, whereas a piston stuck in the **DOWN** position will cause a lean mixture at wide open throttle and poor acceleration.

Measuring the Float Setting

The carburetors are equipped with a synthetic rubber tipped fuel inlet needle. The needle tip is a rubber material which is not affected by gasoline and is stable over a wide range of temperatures. The tip is flexible enough to make a good seal on the needle seat.

The use of this inlet needle requires a care when adjusting the float setting. Care should be taken to perform this operation accurately in order to secure the best performance and fuel economy.

(1) To correctly set the float height, when the carburetor is being overhauled, install the floats with the fulcrum pin and pin retainer in the main body.

(2) Install the needle, seat and gasket in the body and tighten securely.

(3) Invert the main body so that the weight of the floats **only**, is forcing the needle against the seat. Hold the finger against the retainer to fully seat the fulcrum pin.

(4) Using Tool T109-282 or T109-220; or a T scale, measure the float, as shown in Figure 12. There should be ¼ or 5/16 inch (Taxi) (depending on carburetor, refer to Specifications,) from the surface of the fuel bowl to the crown of each float at the center.

If an adjustment is necessary, bend the lip of the float lever either in or out until correct setting has been obtained.

CAUTION: Do not attempt to change the setting without removing the float, as the synthetic rubber tip can be compressed sufficiently to cause a false setting which will affect correct level of fuel in the bowl. After being compressed, the tip is very slow to recover its original shape. Remeasure as described in Step 4 above.

NOTE: It is very important that the float lip be perpendicular to the needle or slanted not more than 10 degrees away from the needle when the float is set correctly.

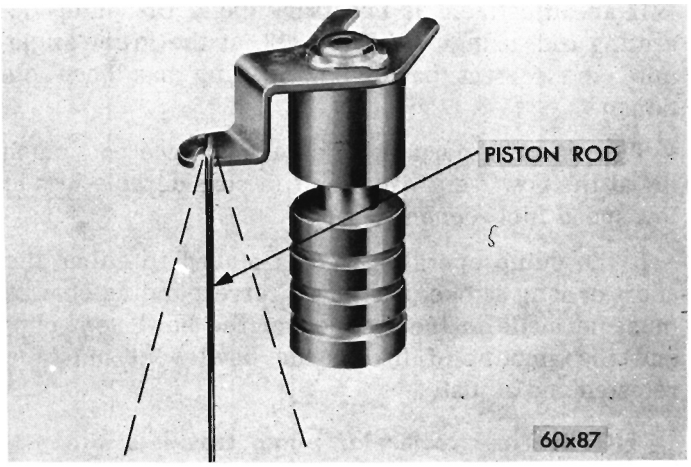


Fig. 11—Step-Up Rod Free Play

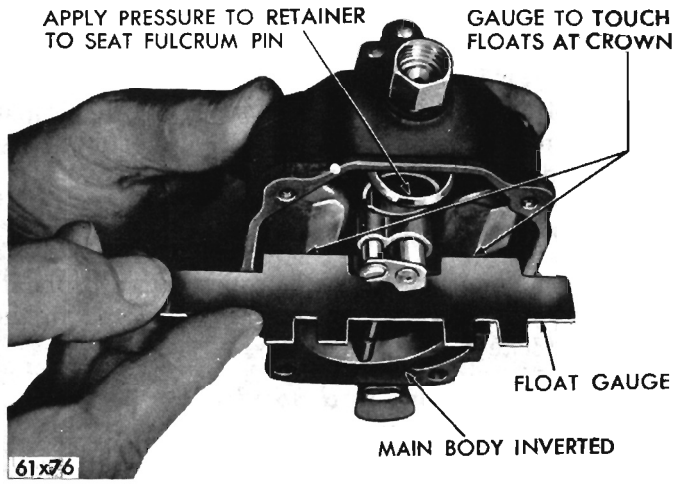


Fig. 12—Measuring the Float Setting

(5) Place a new gasket on the throttle body and position the main body making sure they are aligned.

Air Horn

Inspect the freedom of the choke mechanism in the air horn. The shaft must float free to operate correctly. Clean thoroughly.

(1) Assemble the pump plunger, spring and spring seat and slide the plunger shank through the opening in the air horn. Install the bowl vent cap over the plunger shank, then engage with pump rocker arm. (On the BBS-3681S carburetor, be sure the hairpin clip is in the upper position on the plunger rod; all others in the middle position.)

(2) Place a new gasket on the main body, then install the air horn by tilting the air horn, as shown in Figure 3, in order to engage the fast idle link with the fast idle cam. After engaging the link, slowly lower the air horn and at the same time guide the accelerator plunger into its well.

(3) Install the air horn attaching screws. Tighten securely.

(4) Install the accelerator pump operating rod and secure with the hairpin clip. Normal operation of the accelerator pump is obtained by installing the pump rod in the center hole of the throttle arm (On the BBS-3681S carburetor, be sure the pump rod is in the short stroke hole of the throttle arm).

Installing the Vacuum Diaphrgam

(1) Install the diaphragm assembly on the air horn and tighten the attaching screws securely.

(2) Install the choke operating link in position between the diaphragm plunger (stem) and the choke lever. Install the clip to secure.

(3) Inspect the vacuum diaphragm fitting and remove any dirt or foreign material which could plug the passage. Inspect the rubber hose for cracks, before placing it on the correct fitting (Refer to Fig. 1).

Do not connect the vacuum hose to the diaphragm fitting until after the vacuum kick adjustment has been made (See Carburetor Adjustments).

2. CARBURETOR ADJUSTMENTS

It is very important that the following adjustments be made on a reconditioned carburetor, and in the sequence listed:

Accelerator Pump and Bowl Vent

When assembling the accelerator pump to the air horn, note that the hair pin clip (which opens the bowl vent) can be placed in any one of the three positioning notches. These notches correspond to the long, medium and short pump stroke holes in the throttle lever. Normally, the bowl vent clip on the pump stem will be at the middle notch and the pump operating rod in the medium stroke hole.

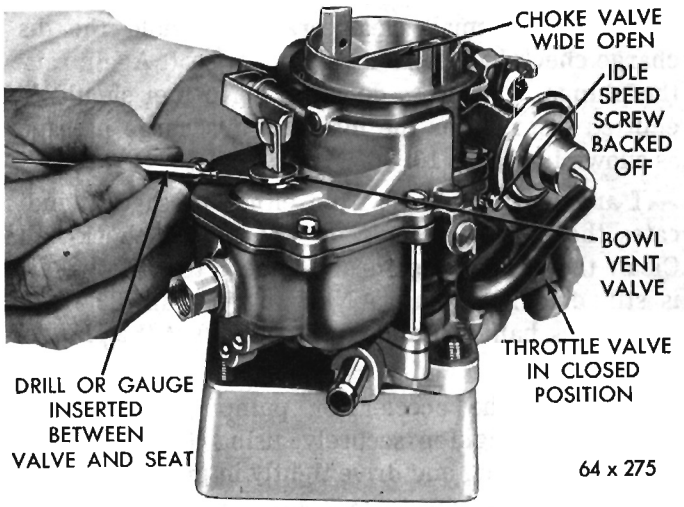


Fig. 13—Measuring the Bowl Vent Opening

The proper procedure is to adjust the amount of bowl vent opening instead of measuring and setting the height of the pump plunger.

To test or set the adjustment, proceed as follows:

(1) Back off the idle speed adjusting screw. Open the choke valve, so that when the throttle valves are closed, the fast idle adjusting screw will not contact the fast idle cam.

(2) Be sure the pump operating rod is in the medium stroke hole in the throttle lever, and that the bowl vent clip on the pump stem is in the center notch.

(3) Close the throttle valves tightly. It should be just possible to insert a $\frac{1}{16}$ inch drill (.060″) between the bowl vent and the air horn, as shown in Figure 13.

If an adjustment is necessary, bend the pump operating rod, using Tool T109-213, at the lower angle, until the correct bowl vent opening has been obtained.

This is an important adjustment, since too much lift at the bowl vent will result in considerable loss in low speed fuel economy.

If the pump operating rod is moved to either the short or long stroke position, a corresponding change must be made in the location of the bowl vent clip, and the amount of lift of the bowl vent must be retested and adjusted.

NOTE: The accelerator pump travel is automatically taken care of when the bowl vent is properly adjusted.

Fast Idle Speed and Cam Position Adjustment

The fast idle engine speed adjustment should be made on the car, as described in the Paragraph "Fast Idle Speed Adjustment". However, the Fast Idle Cam Position Adjustment can be made on the bench.

(1) With the fast idle speed adjusting screw contacting the lowest step on the fast idle cam, as shown in Figure 14, move the choke valve toward the closed position with light pressure. Insert a drill or gauge between the choke valve and the wall of the airhorn (Refer to Specifications for Drill or Gauge Size).

(2) An adjustment will be necessary if a slight drag is not obtained as the drill or gauge is being removed.

(3) If an adjustment is necessary, bend the fast idle rod at the upper angle, using Tool T109-213, until the correct valve opening has been obtained (Refer to Figure 14).

Vacuum Kick Adjustment—(This test can be made **On** or **Off** the vehicle).

To make the vacuum kick adjustment, the vacuum diaphragm must be energized (either a distributor testing machine with a vacuum source, or vacuum supplied by another vehicle). To make this adjustment, proceed as follows:

(1) With the engine **Not** running, open the throttle valves far enough to allow the choke valve to be moved to the closed position.

(2) Disconnect the vacuum hose from the diaphragm and connect the hose from the vacuum supp as shown in Figure 15 (A minimum of 10 inches of mercury (HG) will be required).

(3) Use a $^{11}/_{64}$ inch drill or gauge for Manual Transmission or a $^{1}/_{8}$ inch drill or gauge for Automatic Transmission and insert the gauge between the choke valve and the wall of the air horn. Apply a slight closing pressure to the choke shaft.

(4) An adjustment will be necessary if a slight drag is not obtained as the drill or gauge is being removed.

The adjustment of this opening will require the removal of the choke operating link.

CAUTION: Damage to the diaphragm and the choke lever slot can result, if the link is not removed for the bending operation.

(5) Remove the clip and disengage the choke operating link from the diaphragm stem, then disengage the link from the choke lever (The best bending results will be obtained by using a vise and a pair of pliers).

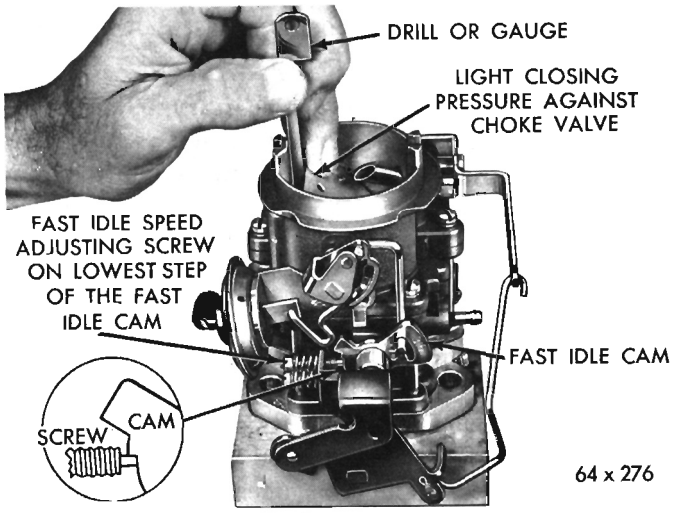


Fig. 14—Fast Idle Cam Position Adjustment

(6) Bend the choke operating link at the angle to provide the correct choke valve opening.

CAUTION: A correction in the length of the link of .010 inch, will result in a change of .015 inch in the choke valve opening.

As an example, if the choke valve opening is 0.015 inch in error, the correction in the link length would be .010 inch.

A 2 inch micrometer will be helpful in establishing the original length of the link, as shown in Figure 16, before completing the adjustment.

(7) Install the choke operating link and recheck the choke valve opening, using a gauge or drill (Refer to Fig. 15).

Reinstall the vacuum hose to the diaphragm and make the following check:

(8) With no vacuum applied to the diaphragm, some clearance should exist between the choke operating link and the choke lever slot, in both the open

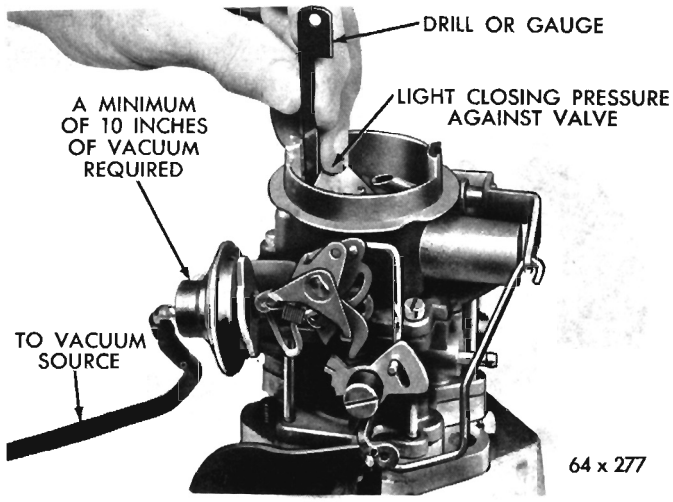


Fig. 15—Vacuum Kick Adjustment

and closed choke valve positions, as shown in Figure 17.

NOTE: This clearance is necessary to allow the choke valve to close for starting as well as fully open after the engine reaches the normal operating temperature.

If a clearance does not exist in both of these positions, a recheck of the operating link adjustment should be made.

NOTE: Free movement of the choke valve between the closed and open positions is very necessary.

This free movement should also exist between the kick and the open choke valve positions with the engine running. If binding does exist, the choke operating link has been improperly bent and should be corrected.

(9) Readjust the idle speed screw to obtain the correct idle speed after making the adjustment.

Idle Speed Adjustment (Curb Idle)

To make the idle speed adjustment, the engine must be thoroughly warmed up. A much more reliable idle adjustment can usually be obtained if the vehicle has been driven a minimum of five miles. For the best results, it is recommended that a tachometer be used in this adjustment (Before making the idle speed adjustment, observe the following precautions:)

Because the alternator can charge at idle speeds and impose a load on the engine, the headlamps should be turned **on** the high beam. This will assure setting the idle to compensate for the alternator load. On vehicles equipped with automatic transmission, unsnap the ball joint connection at the accelerator shaft bell crank. If this is not done, it is possible that the carburetor throttle will be held open against the stop in the transmission. The carburetor would therefore not respond to adjustment of the idle speed screw. After the proper idle speed has been obtained at the carburetor, screw the ball joint connector up or down until the ball on the bell

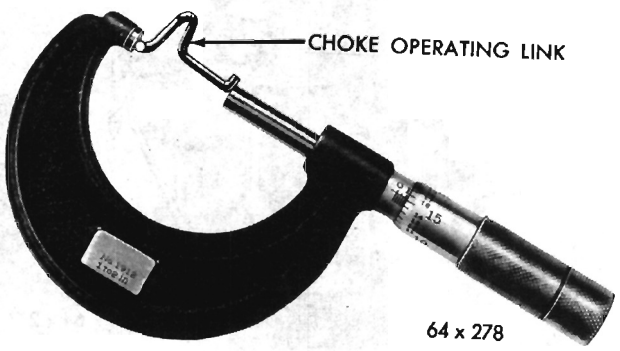


Fig. 16—Choke Operating Link Measurements

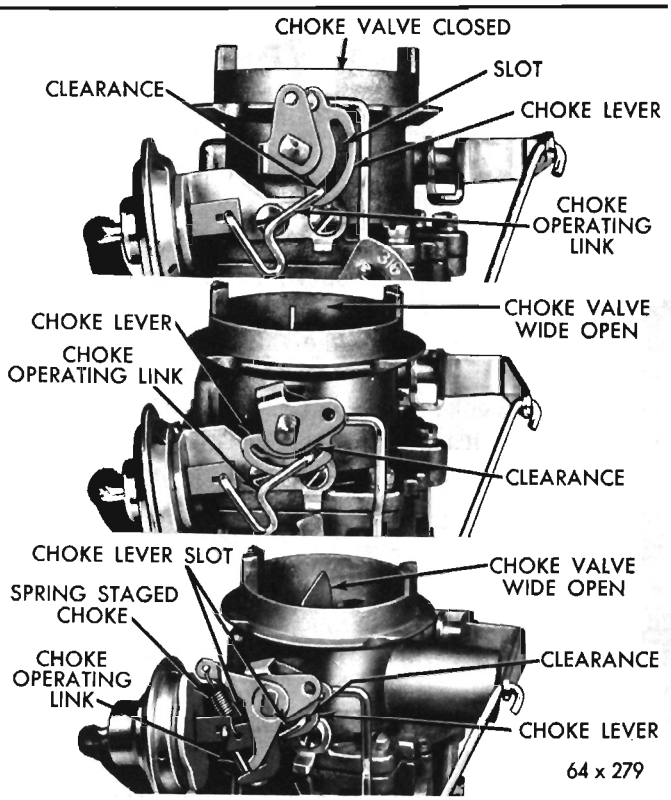


Fig. 17—Choke Operating Link Clearances

crank will exactly mate with the socket. Snap into place.

To make the idle speed adjustment, proceed as follows:

(1) Turn the idle speed screw **in** or **out** to obtain 550 rpm (Be sure that the choke valve is fully open and that the fast idle adjusting screw is not contacting the cam).

(2) Adjust the idle mixture screw to obtain the highest rpm. While making the adjustment, carefully watch the tachometer and notice that the speed can be decreased by turning the screw in either direction from the setting that gave the highest rpm reading.

(3) From the highest idle speed setting, turn the mixture screw clockwise (leaner) until the speed starts to drop. Turn the screw in the opposite direction (counter-clockwise) just far enough to recover the speed that was lost.

This procedure will assure that the idle has been set to the leanest mixture possible for smooth idle. **This setting is very important.**

Since the correct speed was originally set using the speed screw, the speed obtained after finding the leanest smooth idle setting will probably be too fast.

(4) Readjust the speed screw to obtain the correct idle speed. Repeat steps 2 and 3 above.

Fast Idle Speed Adjustment (On the Vehicle)

To set the fast idle speed on the vehicle, connect a

tachometer to the vehicle, then set the curb idle speed.

(1) With the engine running, and the transmission in the neutral position, open the throttle slightly.

(2) Close the choke valve about 20 degrees then allow the throttle to close. Return the choke valve to the open position.

(3) The fast idle speed adjusting screw should be contacting the lowest step on the fast idle cam, as shown in Figure 19.

(4) With the engine warmed-up to the normal operating temperature, turn the fast idle speed adjusting screw **in** or **out** to secure 700 rpm. **Reposition the cam and throttle after every screw adjustment.**

Choke Unloader (Wide Open Kick)

(1) Hold the throttle valve in the wide open position, insert Tool T109-28 or $\frac{3}{16}$" drill between the upper edge of the choke valve and the inner wall of the air horn, as shown in Figure 18.

(2) If no drag is felt, or if too much drag is apparent, bend the unloader tang on the throttle lever, unti the correct clearance has been obtained.

3. AUTOMATIC CHOKE—WELL TYPE

To function properly, it is important that all parts be clean and move freely. Other than an occasional cleaning, the choke requires no servicing. However, it is very important that the choke control unit work freely in the well and at the choke shaft. Move the choke rod up and down to test for free movemet in the pivot. If the unit binds, a new choke unit should be installed.

NOTE: The Well Type Choke Unit is serviced as an assembly. Do not attempt to repair, or change the setting.

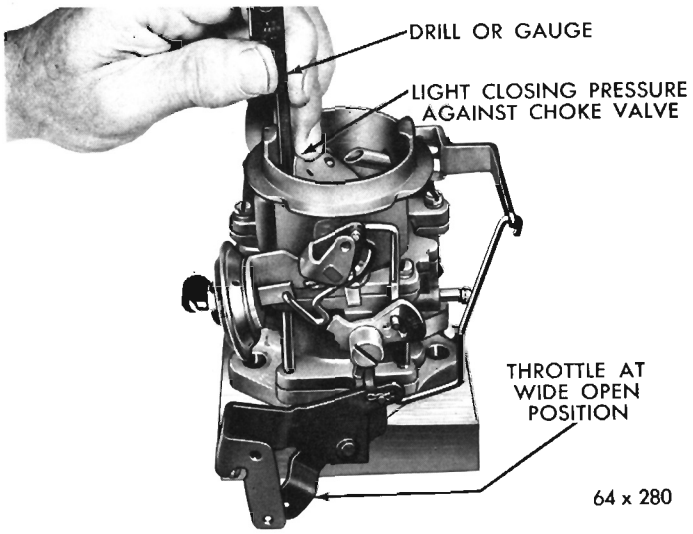


Fig. 18—Measuring the Choke Unloader Setting

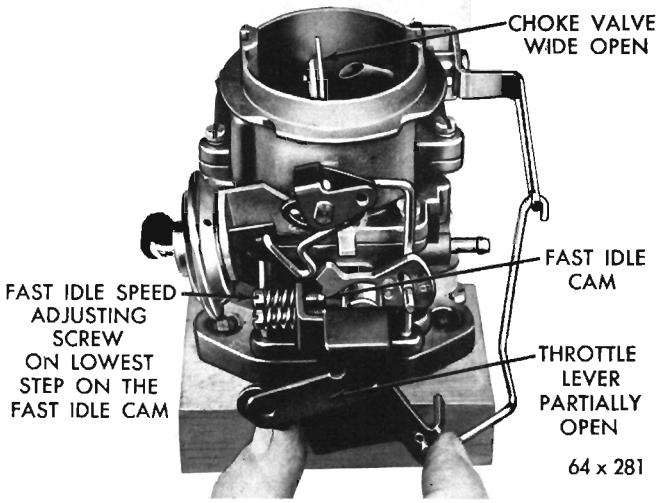


Fig. 19—Fast Idle Speed Adjustment (On the Vehicle)

When installing the well type choke unit, be certain that the coil housing does not contact the sides of the well in the exhaust manifold. Any contact at this point will affect choke operation. DO NOT lubricate any parts of the choke or the control unit. This causes an accumulation of dirt which will result in binding of the mechanism.

Spring Staged Choke Adjustment

(1) Push on the hub lever with the finger, at the closed choke position. A small opening should exist between the shaft and the hub levers, as shown in Figure 20.

(2) Using a drill or gauge, measure the opening. The opening should be from .020 to .030 inches.

(3) If an adjustment is necessary, bend the hub lever tang until the correct opening has been obtained.

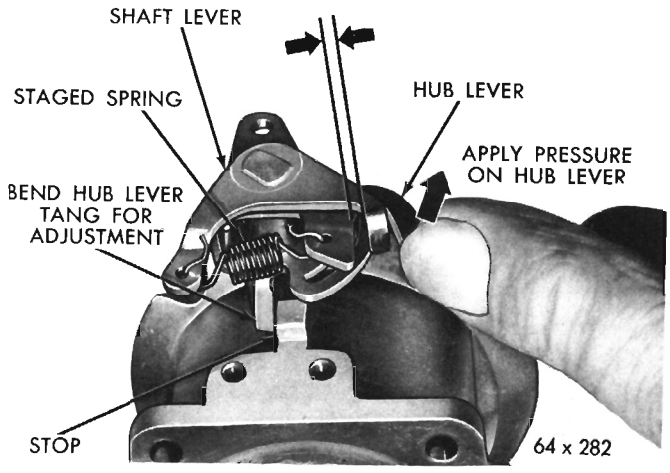


Fig. 20—Spring Staged Choke Adjustment

4. CLOSED CRANKCASE VENT SYSTEM

The closed crankcase ventilator valve is located in the crankcase vent tube cap and is connected to the carburetor throttle body via a rubber tube.

The function of the valve is to control the unburned fuels that originate in the crankcase. The gases are returned to the intake manifold, fed back into the combustion chambers and then expelled out through the exhaust system as completely burned products.

For servicing procedures of this valve, refer to Group 9 "Engine"

13. MEASURING THE FLOAT SETTING— (On the Vehicle)

To measure the float setting with the carburetor mounted on the vehicle, proceed as follows:

(1) Remove the accelerator pump operating rod.

(2) Remove two of the long air horn attaching screws and two short screws, then install the two short screws in place of the two long screws removed. This will hold the main body to the throttle body. Tighten screws securely.

(3) Remove the remaining air horn screws, then tilt the air horn far enough to disengage the fast idle cam link from the fast idle cam. Remove the air horn and gasket.

Measure the float setting as follows:

(4) Seat the float fulcrum pin by pressing on the fulcrum retainer.

There should be enough fuel in the bowl to raise the float so that the lip bears firmly against the needle. Additional fuel may be admitted by slightly depressing the float. If the fuel pressure in the line is insufficient to force additional fuel into the bowl, add the necessary fuel from a clean container.

CAUTION: Since the manifolds may be hot, it is dangerous to spill fuel on these surfaces. Therefore, take the necessary precautions to avoid spillage.

(5) With only the pressure of the buoyant float holding the float lip against the inlet needle, measure the float setting, using Tool T109-282 or T109-220; or a "T" scale. There should be ¼ inch from the surface of the bowl (gasket removed) to the crown of the floats at the center ($\frac{5}{16}$" on Taxi).

If an adjustment is necessary, hold the float on the bottom of the bowl, then bend the float lip toward or away from the needle. Remeasure the ¼ inch or $\frac{5}{16}$ inch taxi setting again, then repeat the lip bending operation as required.

CAUTION: When bending the float lip, do not allow the lip to push against the needle as the tip can be compressed sufficiently to cause a false setting which will affect correct level of the fuel in the bowl. After being compressed, the tip is very slow to recover its original shape.

It is very important that the float lip be perpendicular to the needle or slanted not more than 10 degrees away from the needle when the float is correctly set.

(6) Reassemble the air horn as described previously.

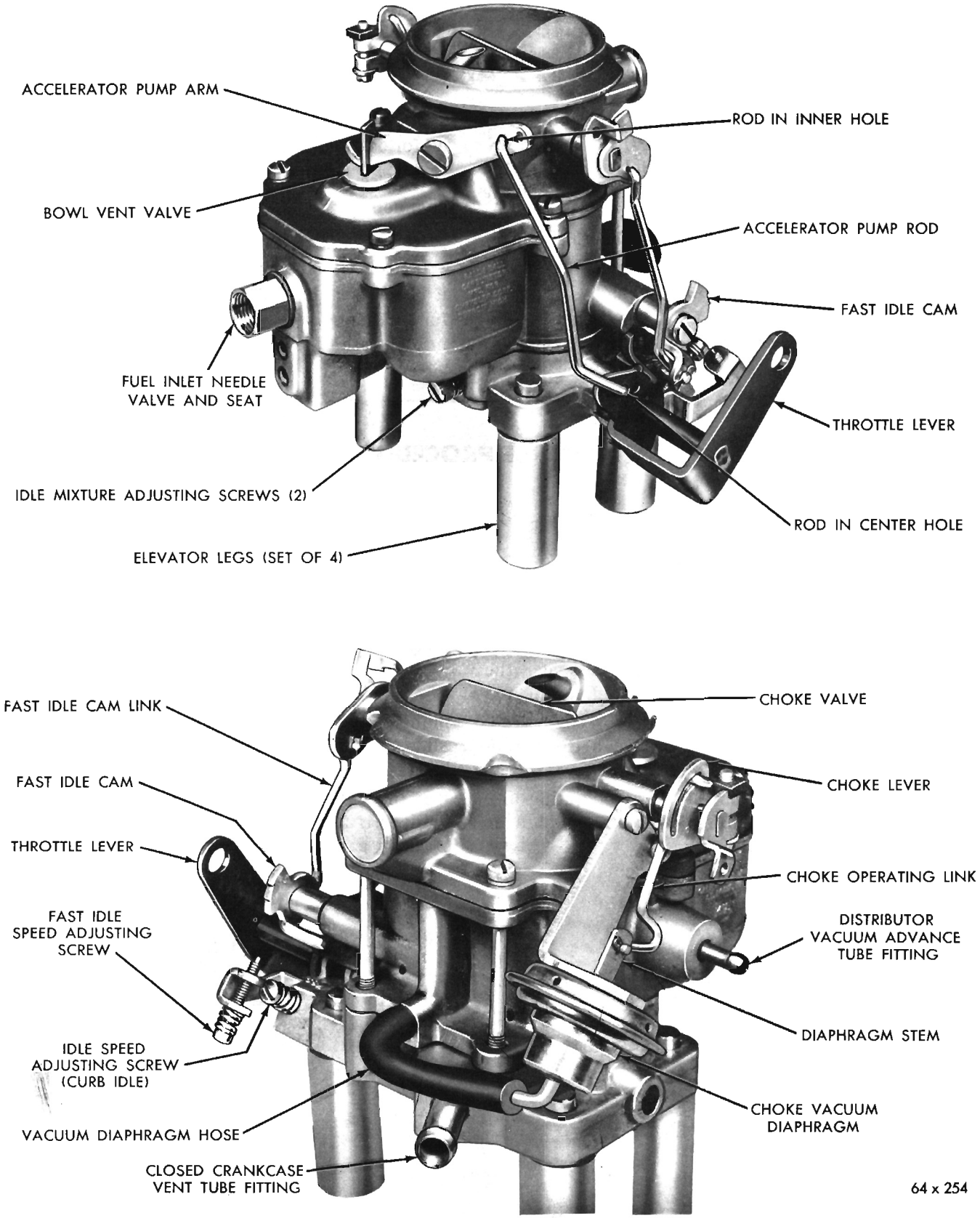


Fig. 1—Carburetor Assembly (BBD 3682S, 3683S)

PART 3

CARBURETOR (BBD SERIES)
BBD-3682S AND BBD-3683S

Often, the carburetor is blamed for a great variety of trouble which is classed as "POOR CAR PERFORMANCE." Therefore, be definitely sure that the trouble is not located elsewhere before disassembling the carburetor.

When overhauling the carburetor, several items of importance should be observed to assure a good job:

(1) The carburetor must be completely disassembled.

(2) All parts (except the diaphragm assembly) should be cleaned in a suitable solvent then inspected for damage or wear.

(3) Use air pressure only, to clean the orifices or channels.

(4) Replace questionable parts with NEW ONES. When checking parts removed from the carburetor, it is at times difficult to be sure they are satisfactory for further service. It is therefore recommended that in such case, NEW parts be installed.

SERVICE PROCEDURES

1. CARBURETOR

Disassembly (Fig. 1)

(1) Place the carburetor assembly on the repair block Tool C-3225.

(2) Remove the hairpin clips and disengage the accelerator pump operating rod.

(3) Remove the hairpin clip and disengage the fast idle connector rod from the fast idle cam and choke lever.

(4) Remove the vacuum hose between the carburetor main body and the vacuum diaphragm.

(5) Remove the clip from the choke operating link and disengage the link from the diaphragm plunger (stem) and the choke lever.

(6) Remove the vacuum diaphragm and bracket assembly and place to one side to be cleaned as a separate item. **A liquid cleaner may damage the diaphragm material.**

(7) Remove the air horn retaining screws and lift the air horn straight up and away from the main body, as shown in Figure 2. Discard the gasket.

(8) Disengage the accelerator pump plunger from the rocker arm by pushing up on the bottom of plunger and sliding the plunger shaft off the hook. Slide the plunger out of the air horn and remove the bowl vent valve, spring seat and spring.

If the old plunger can be used again, or if a new plunger is to be installed, place the plunger in a jar of clean gasoline or kerosene to prevent the leather

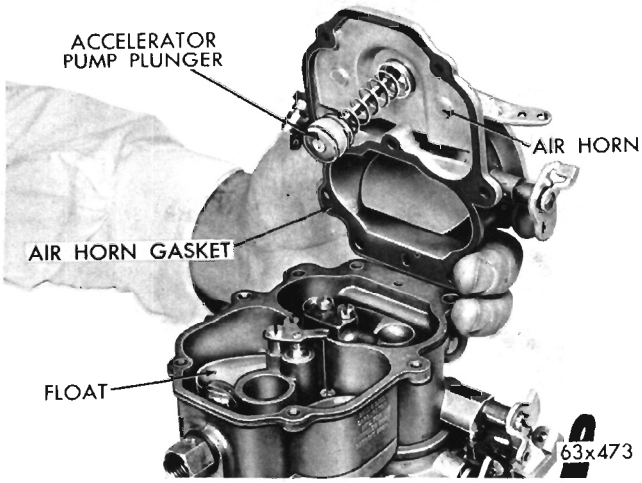


Fig. 2—Removing or Installing the Air Horn

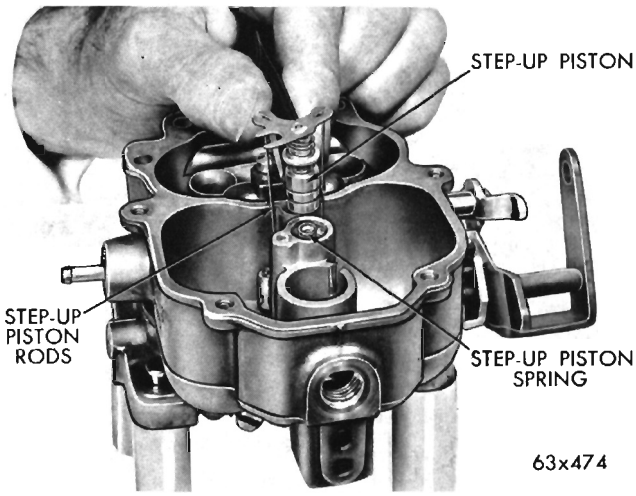


Fig. 3—Removing or Installing Step-Up Piston

from drying out.

(9) Remove the fuel inlet needle valve, seat and gasket from the main body.

(10) Lift out the float fulcrum pin retainer, then lift out the floats and fulcrum pin.

(11) Remove the step-up piston retaining screw, and slide the step-up piston and rods out of the well, as shown in Figure 3. Lift out the step-up piston spring. Remove the step-up piston gasket from the bottom of the well.

(12) Remove the main metering jets and gaskets, as shown in Figure 4.

(13) Remove the venturi cluster screws then lift the venturi cluster and gaskets up and away from the main body, as shown in Figure 5. Discard the gaskets. **Do not remove the idle orifice tubes or main vent tubes from the cluster.** They can be cleaned in a solvent and dried with compressed air.

(14) Invert the carburetor and drop out the accelerator pump discharge check ball.

(15) Remove the idle mixture adjusting screws and springs from the throttle body.

(16) Remove the screws that attach the throttle body to the main body. Separate the bodies and discard the gasket.

It is usually not advisable to remove the throttle shaft or valves from the throttle body, unless wear or damage necessitates the installation of new parts.

(17) Test the freeness of the choke mechanism in the air horn. The choke shaft must float free to operate correctly. If the choke shaft sticks in the bearings, or appears to be gummed from deposits in the air horn, a thorough cleaning will be required.

The carburetor now has been disassembled into three main units, namely, the air horn, main body

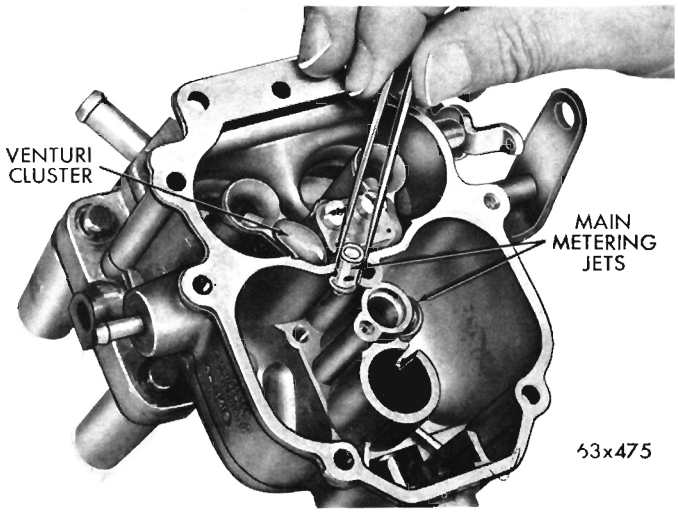


Fig. 4—Removing or Installing Main Metering Jets

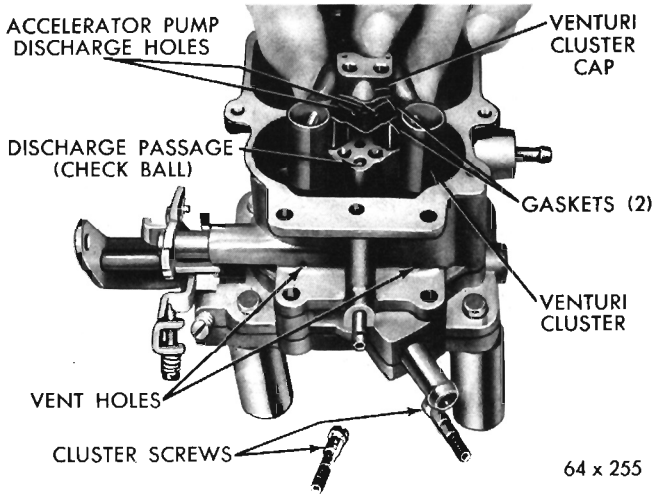


Fig. 5—Removing or Installing Venturi Cluster

and throttle body and the component parts of each disassembled as far as necessary for cleaning and inspection.

Cleaning the Carburetor Parts

The recommended solvent for gum deposits is denatured alcohol which is easily obtainable. However, there are other commercial solvents which may be used with satisfactory results.

The choke diaphragm can be damaged by solvents. Avoid placing the diaphragm assembly in **ANY** liquid. Clean the external surfaces with a clean cloth or soft wire brush. Shake dirt or foreign material from the stem side of the diaphragm. Depressing the diaphragm stem (plunger) to the retracted position, will provide an additional hole for the removal of dirt. Compressed air can be used to remove loose dirt **but should not be connected to the vacuum inlet fitting.**

IMPORTANT: If the commercial solvent or cleaner recommends the use of water as a rinse, it should be "HOT". After the rinsing, all trace of water must be blown from the passages with air pressure. It is further advisable to rinse all parts in clean kerosene or gasoline to be certain no trace of moisture remains. Never clean jets with a wire, drill or other mechanical means, because the orifices may become enlarged, making the mixture too rich for proper performance.

Inspecting and Reassembly— Throttle Body

(1) Inspect the throttle shaft for excessive wear in the throttle body. (If wear is extreme, it is recommended that the throttle body assembly be replaced rather than installing a new shaft in the old body).

During manufacture, the location of the idle trans-

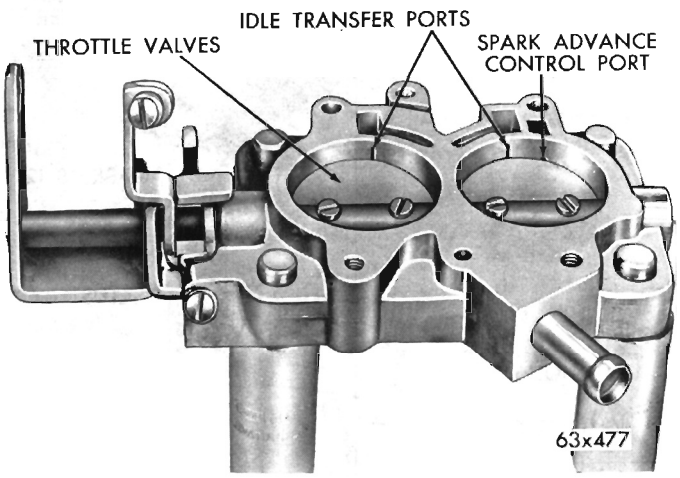


Fig. 6—Ports in Relation to Throttle Valves

fer port and the spark advance control ports to the throttle valve, is carefully established for one particular assembly. (See Fig. 6).

If a new shaft should be installed in an old, worn throttle body, it would be very unlikely that the original relationship of the ports to the valves would be obtained. Changing the relationship of the valves to the ports would adversely affect normal car operation between the speed of 15 and 20 miles per hour. However, if it has been determined that a new shaft or valves is to be installed, adhere to the following instructions:

(2) Mark the position of the throttle valves to the shaft, then slide the valves out of the bores.

CAUTION: These screws are staked on the opposite side and care should be used at removal so as not to break off in the shaft.

(4) Slide the throttle shaft out of the throttle body. Remove the fast idle speed screw lever.

(5) Slide the fast idle speed screw lever over the new throttle shaft and insert into the throttle body.

(6) Install the throttle valves in their respective bores (with the valve numbers toward manifold flange). Install **NEW** screws but do not tighten. Hold the valves in place, with the fingers pressing on the high sides of the valves. Tap the valves lightly with a screw driver to seat valves in the throttle bores.

Tighten the screws securely and stake by squeezing with pliers.

(7) Install the idle mixture screws and springs in the throttle body. (The tapered portion must be straight and smooth. If the tapered portion is grooved or ridged, new idle mixture screws should be installed to insure having the correct idle mixture control). **Do Not Use a Screw Driver.** Turn the screws **lightly** against their seats with the fingers. Back off 1 full turn for approximate adjustment.

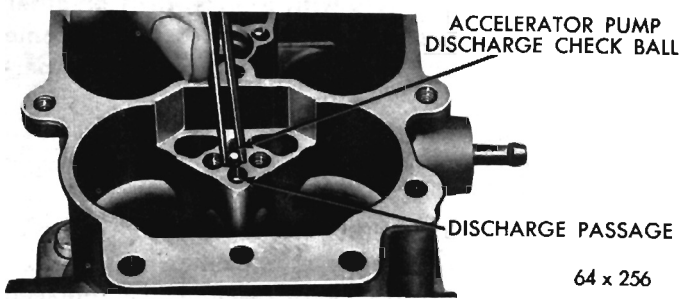


Fig. 7—Installing Accelerator Pump Discharge Check Ball

Main Body

(1) Invert the main body and place a new gasket in position, then place the throttle body on the main body and align. Install screws and tighten securely.

(2) Install the accelerator pump discharge check ball in the discharge passage, as shown in Figure 7.

To test the accelerator pump system; fuel inlet and discharge check balls, proceed as follows:

(3) Pour clean gasoline into the carburetor bowl, approximately ½ inch deep. Remove the pump plunger from the jar of gasoline and slide it down into the pump cylinder. Raise the plunger and press lightly on the plunger shaft to expell air from the pump passage.

(4) Using a small clean brass rod, hold the discharge check ball down firmly on its seat. Again raise the plunger and press downward. No fuel should be emitted from either the intake or discharge passage, as shown in Figure 8.

If any fuel does emit from either passage, it indicates the presence of dirt or a damaged check ball. Clean the passage again and repeat test. If leakage

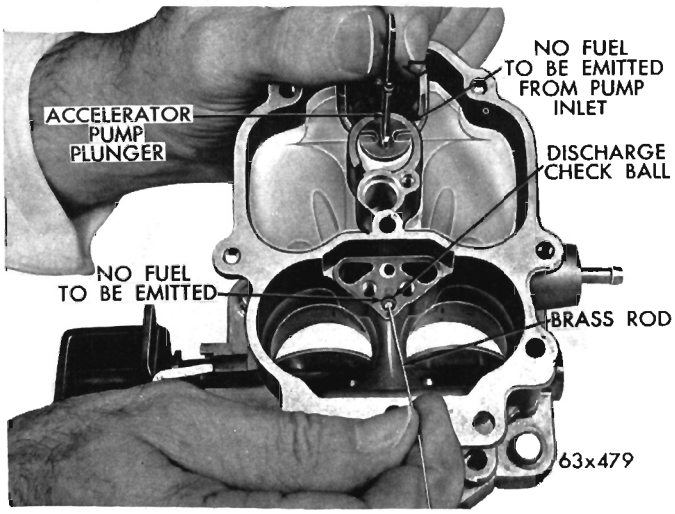


Fig. 8—Testing Accelerator Pump Intake and Discharge Check Balls

is still evident, install a new check ball. The fuel inlet check ball is located at the bottom of the plunger well and should rattle freely when the carburetor is shaken. Remove the fuel from the bowl.

(5) Install new gaskets on the venturi cluster, then install in position in the main body. (Refer to Fig. 5). Install the idle bleed screws and tighten securely.

(6) Install the main metering jets and gaskets, tighten securely. (Refer to Fig. 4).

(7) Before installing the step-up piston, be sure the step-up rods are able to move freely each side of the vertical position, as shown in Figure 9. The step-up rods must be straight and smooth.

(8) Slide the step-up piston gasket down into position in the piston well, then install the step-up piston spring and step-up piston and rods. Carefully guide the step-up rods into the main metering jets. (Refer to Fig. 3). Install the retaining screw and tighten securely.

A step-up piston stuck in the **UP** position will cause a rich mixture at part throttle a piston stuck in the **DOWN** position will cause a lean mixture at wide open throttle and poor acceleration.

Measuring the Float Setting

The carburetors are equipped with a synthetic rubber tipped fuel inlet needle. The needle tip is a rubber material which is not affected by gasoline and is stable over a wide range of temperatures. The tip is flexible enough to make a good seal on the needle seat, and to give increased resistance to flooding.

The use of this inlet needle requires a new procedure in adjusting the float setting. Care should be taken to perform this accurately in order to secure the best performance and fuel economy.

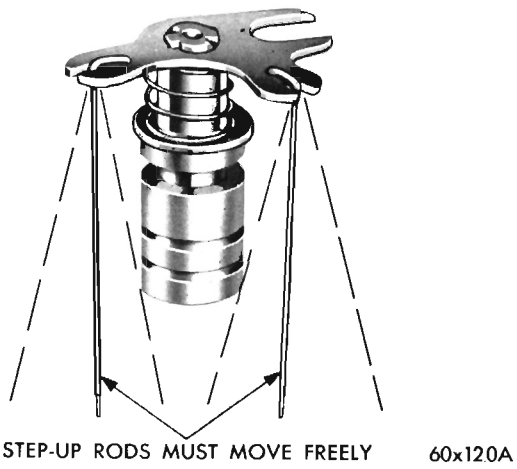


Fig. 9—Step-Up Piston and 2 Stage Rods

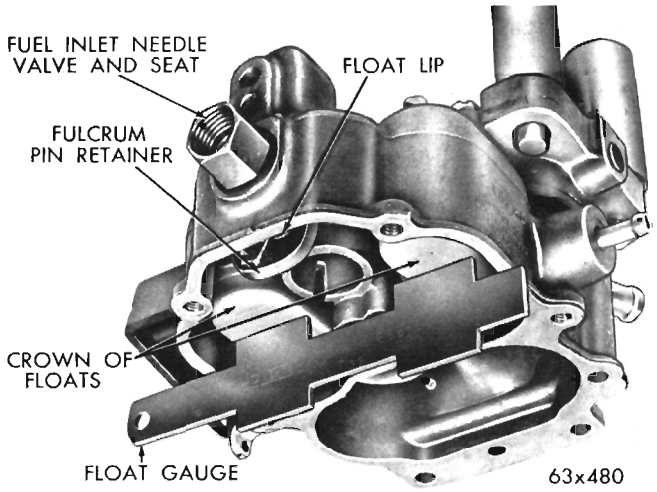


Fig. 10—Measuring the Float Setting

To correctly set the float height, when the carburetor is being overhauled, proceed as follows:

(1) Install the floats with the fulcrum pin and pin retainer in the main body.

(2) Install the needle, seat and gasket in the body and tighten securely.

(3) Invert the main body so that the weight of the floats **only,** is forcing the needle against the seat. Hold a finger against the retainer to fully seat the fulcrum pin.

(4) Using Tool T109-282 or a "T" scale, measure the float, as shown in Figure 10. There should be ¼ inch from the surface of the fuel bowl to the crown of each float at the center.

If an adjustment is necessary, hold the floats on the bottom of the bowl and bend the float lip toward or away from the needle. Remeasure the ¼ inch setting again then repeat the lip bending operation as required.

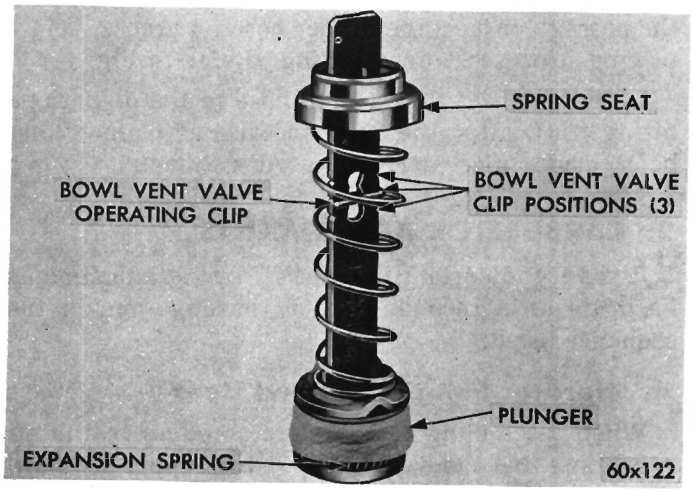


Fig. 11—Accelerator Pump Assembly

CAUTION: When bending the float lip, do not allow the lip to push against the needle as the synthetic rubber tip can be compressed sufficiently to cause a false setting which will affect correct level of fuel in the bowl. After being compressed the tip is very slow to recover its original shape.

It is very important that the float lip be perpendicular to the needle or slanted not more than ten degrees away from the needle when the float is set correctly.

Air Horn

(1) Assemble the pump plunger, spring and spring seat, as shown in Figure 11. Slide the plunger shaft through the opening in the air horn. Install the bowl vent valve over the plunger shaft, then engage with the pump rocker arm.

(2) Place a new gasket on the main body, then install the air horn (Refer to Fig. 2). Install attaching screws and tighten securely. (When installing air horn, be sure the leather on the plunger does not fold back).

(3) Engage the fast idle connector rod in the choke lever and fast idle cam. Secure with the hairpin clip.

(4) Engage the accelerator pump operating rod in the inner hole in the rocker arm and in the center hole in the throttle lever (Refer to Fig. 1). Install clips to secure.

Installing the Vacuum Diaphragm

(1) Install the diaphragm assembly on the air horn and tighten the attaching screws securely.

(2) Install the choke operating link in position between the diaphragm plunger (stem) and the choke lever. Install the clip to secure.

(3) Inspect the vacuum diaphragm fitting and remove any dirt or foreign material which could plug the passage. Inspect the rubber hose for cracks, before placing it on the correct fitting. (Refer to Fig. 1).

Do not connect the vacuum hose to the diaphragm fitting until after the vacuum kick adjustment has been made. (See Carburetor Adjustments).

2. CARBURETOR ADJUSTMENTS

It is very important that the following adjustments be made on a reconditioned carburetor, and in the sequence listed:

Accelerator Pump and Bowl Vent

When assembling the accelerator pump to the air horn, note that the hairpin clip (which opens the bowl vent) can be placed in any one of the three positioning notches. These notches correspond to the long, medium and short pump stroke holes in the throttle lever. Normally, the bowl vent clip on the pump stem will be at the middle notch and the pump operating rod in the medium stroke hole.

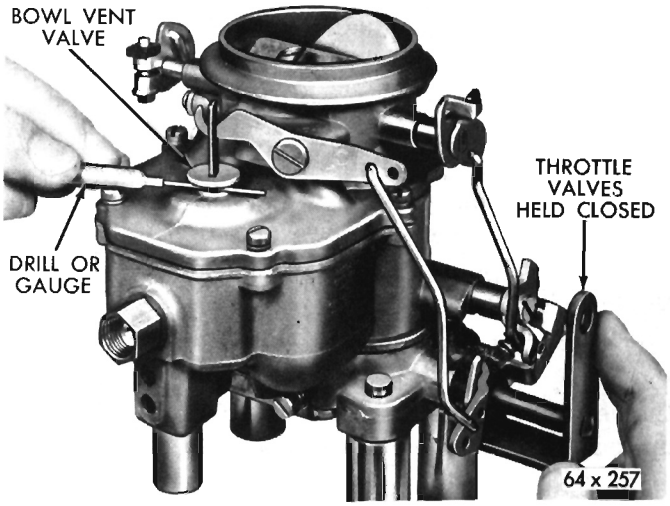


Fig. 12—Measuring Bowl Vent Opening

The proper procedure is to adjust the amount of bowl vent opening instead of measuring and setting the height of the pump plunger.

(1) To test or set the adjustment; back off the idle speed adjusting screw. Open the choke valve so that the fast idle cam allows the throttle valves to be completely seated in the bores.

(2) Be sure the pump operating rod is in the medium stroke hole in the throttle lever, and that the bowl vent clip on the pump stem is in the center notch.

(3) Close the throttle valves tightly. It should be just possible to insert a $\frac{1}{16}$ inch drill between the bowl vent and its seat, as shown in Figure 12.

If an adjustment is necessary, bend the pump op-

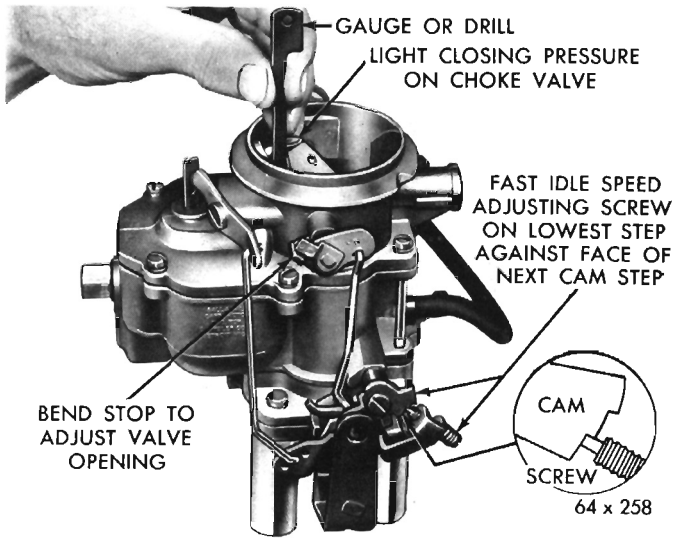


Fig. 13—Fast Idle Cam Position Adjustment

erating rod, using Tool T109-213, at the lower angle, until the correct bowl vent opening has been obtained.

This is an important adjustment, since too much lift at the bowl vent will result in considerable loss in low speed fuel economy.

If the pump operating rod is moved to either the short or long stroke position, a corresponding change must be made in the location of the bowl vent clip, and the amount of lift of the bowl vent remeasured and adjusted.

The acceleration pump travel is automatically taken care of when the bowl vent is properly adjusted.

Fast Idle Speed and Cam Position Adjustment

The fast idle engine speed adjustment should be made on the car, as described in the paragraph "Fast Idle Speed Adjustment". However, the Fast Idle Cam Position Adjustment can be made on the bench.

(1) With the fast idle speed adjusting screw contacting the lowest step on the fast idle cam, as shown in Figure 13, move the choke valve toward the closed position with light pressure. Insert a drill or gauge between the choke valve and the wall of the air horn. (Refer to specifications for drill or gauge size).

(2) An adjustment will be necessary if a slight drag is not obtained as the drill or gauge is being removed.

(3) If an adjustment is necessary, bend the fast idle rod at the upper angle, using Tool T109-213, until the correct valve opening has been obtained. (Refer to Fig. 13).

Vacuum Kick Adjustment—This test can be made **On** or **Off** the vehicle.)

To make the vacuum kick adjustment, the vacuum diaphragm must be energized (either a distributor testing machine with a vacuum source, or vacuum supplied by another vehicle).

(1) With the engine **Not** running, open the throttle valves far enough to allow the choke valve to be moved to the closed position.

(2) Disconnect the vacuum hose from the diaphragm and connect the hose from the vacuum supply, as shown in Figure 14. (A minimum of 10 inches of mercury (HG) will be required).

(3) Insert a $\frac{3}{16}$ inch (Manual Transmission) and (Automatic Transmission) size drill or gauge between the choke valve and the wall of the air horn. (Refer to Fig. 14). Apply a slight closing pressure to the choke shaft.

(4) An ajustment will be necessary if a slight drag is not obtained as the drill or gauge is being removed.

The adjustment of this opening will require the removal of the choke operating link.

CAUTION: Damage to the diaphragm and the choke lever slot can result, if the link is not removed for the bending operation.

(5) Remove the clip and disengage the choke operating link from the diaphragm stem, then disengage the link from the choke lever. (The best bending results will be obtained by using a vise and a pair of pliers).

(6) Bend the choke operating link at the angle to provide the correct choke valve opening.

CAUTION: A correction in the length of the link of .010 inch, will result in a change of .015 inch in the choke valve opening.

As an example, if the choke valve opening is 0.015 inch in error, the correction in the link length would be .010 inch.

A "2" inch micrometer will be helpful in establishing the original length of the link, as shown in Figure 15, before completing the adjustment.

(7) Install the choke operating link and retest the

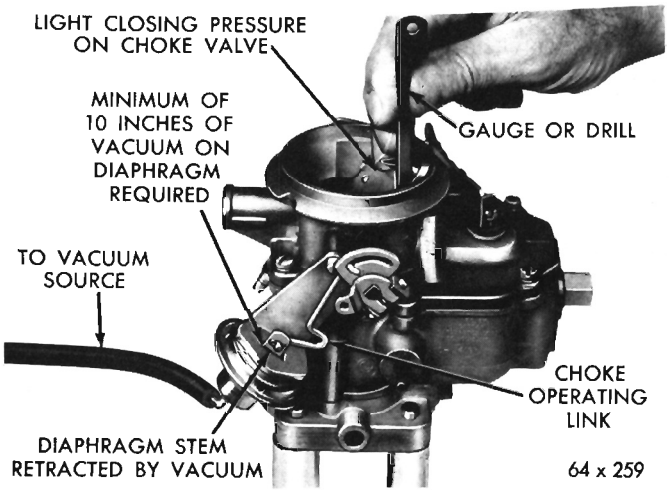


Fig. 14—Testing the Choke Vacuum Kick

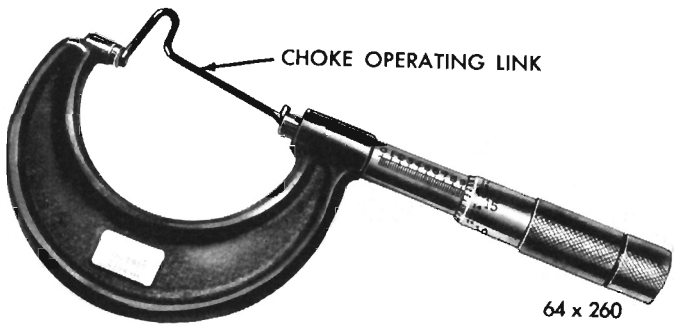


Fig. 15—Choke Operating Link Measurements

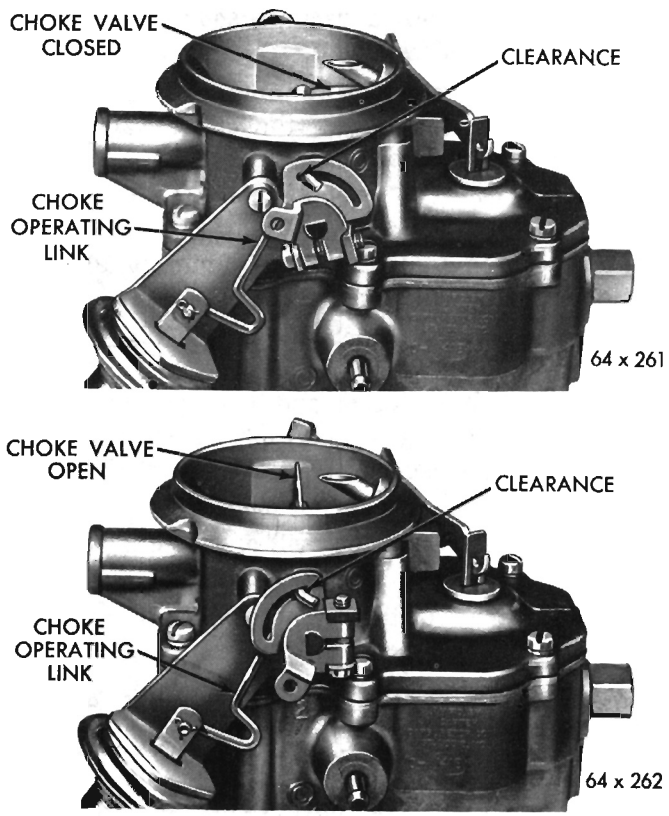


Fig. 16—Choke Operating Link Clearances

choke valve opening, using a gauge or drill. (Refer to Figure 14).

Reinstall the vacuum hose to the diaphragm and make the following check:

(8) With no vacuum applied to the diaphragm, some clearance should exist between the choke operating link and the choke lever slot, in both the open and closed choke valve positions, as shown in Figure 16.

NOTE: This clearance is necessary to allow the choke valve to close for starting as well as fully open after the engine reaches the normal operating temperature.

If a clearance does not exist in both of these positions, a recheck of the operating link adjustment should be made.

NOTE: Free movement of the choke valve between the closed and open positions is very necessary.

This free movement should also exist between the kick and the open choke valve positions with the engine running. If binding does exist, the choke operating link has been improperly bent and should be corrected.

Choke Unloader (Wide Open Kick)

(1) Hold the throttle valves in the wide open position. Insert Tool T109-31 or ¼" drill shank between the upper edge of the choke valve and the inner wall of the air horn, as shown in Figure 17.

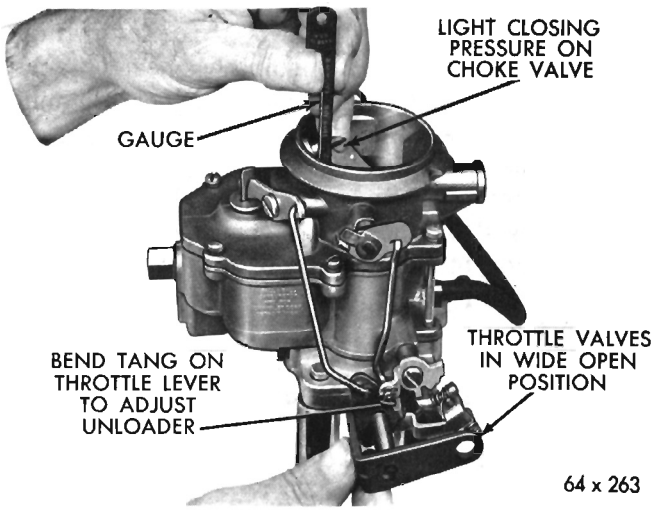


Fig. 17—Measuring the Choke Unloader Setting

(2) If no drag is felt, or if too much drag is apparent bend the unloader tang on the throttle lever, until the correct clearance has been obtained.

Idle Speed Adjustment (Curb Idle)

To make the idle speed adjustment, the engine must be thoroughly warmed up. A much more reliable idle adjustment can usually be obtained if the vehicle has been driven a minimum of five miles. For the best results, it is recommended that a tachometer be used in this adjustment. (Before making the idle speed adjustment, observe the following precautions:)

Because the alternator can charge at idle speeds and impose a load on the engine, the headlights should be turned on (high beam). This will assure setting the idle to compensate for the alternator load. On vehicles equipped with the automatic transmission, disconnect the transmission control rod from the ball joint on the carburetor lever so that the stop in the transmission will not interfere with the free movement of the carburetor throttle lever.

(1) To make the idle speed adjustment, turn the idle speed screw **in** or **out** to obtain 500 rpm (On vehicles with air conditioning set the idle speed at 500 rpm, with air condition **On**). Be sure that the choke valve is fully open and that the fast idle adjusting screw is not contacting the fast idle cam.

(2) Turn each idle mixture screw to obtain the highest rpm. While making the adjustment, carefully watch the tachometer and notice that the speed can be decreased by turning the screws in either direction from the setting that gave the highest rpm reading.

(3) Readjust to 500 rpm with the idle speed screw.

(4) Turn each idle mixture adjusting screw in the clockwise direction (leaner) until there is a slight drop in rpm. Turn each screw out counter-clockwise (richer) just enough to regain the lost rpm.

This procedure will assure that the idle has been set to the leanest mixture possible for smooth idle. **This setting is very important.**

Since the correct speed was originally set using the speed screw, the speed obtained after finding the leanest smooth idle setting will probably be too fast.

(5) Readjust the speed screw to obtain correct idle speed. Repeat steps 2 and 4 above if necessary. After the proper idle speed has been obtained, refer to Figure 3 of the "Throttle Linkage" on Page 73 for the procedure on adjusting the transmission control rod.

Fast Idle Speed Adjustment (On the Vehicle)

To set the fast idle speed on the vehicle, connect a tachometer to the vehicle, then set the curb idle speed.

(1) With the engine running and the transmission in the neutral position, open the throttle slightly.

(2) Close the choke valve about 20 degrees then allow the throttle to close. Return the choke valve to the open position.

(3) The fast idle speed adjusting screw should be contacting the lowest step on the fast idle cam, as shown in Figure 18.

(4) With the engine warmed-up to the normal operating temperature, turn the fast idle speed adjusting screw **in** or **out** to secure 700 rpm. **Reposition the cam and throttle after each screw adjustment.**

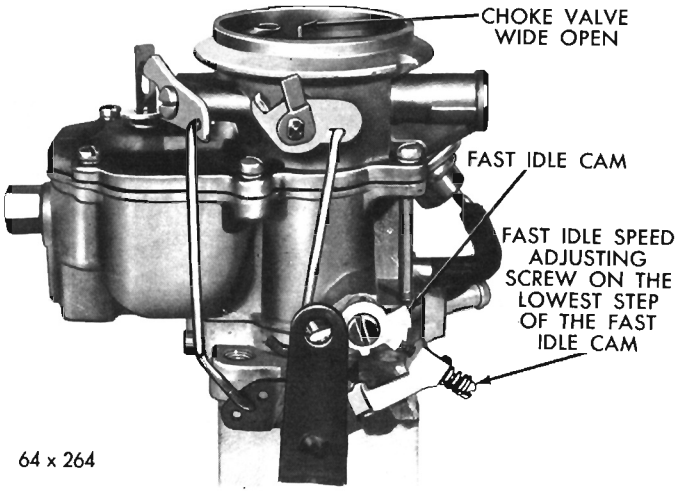


Fig. 18—Fast Idle Speed Adjustment (On the Vehicle)

3. AUTOMATIC CHOKE—WELL TYPE

To function properly, it is important that all parts be clean and move freely. Other than an occasional cleaning, the choke requires no servicing. However, it is very important that the choke control unit work freely in the well and at the choke shaft. Move the choke rod up and down to check movement on the pivot. If the unit binds, a new choke unit should be installed.

NOTE: The Well Type Choke Unit, is serviced as an assembly. Do not attempt to repair.

When installing the well type choke unit be certain that the coil housing does not contact the sides of the well in the intake manifold. Any contact at this point will affect choke operation. **Do Not Lubricate** any parts of the choke or the control unit. This causes an accumulation of dirt which will result in binding of the choke mechanism.

4. CLOSED CRANKCASE VENT SYSTEM

The closed crankcase ventilator valve is located in the crankcase vent tube cap and is connected to the carburetor throttle body via a rubber tube.

The function of the valve is to control the unburned fuels that originate in the crankcase. The gases are returned to the intake manifold, fed back into the combustion chambers and then expelled out through the exhaust system as completely burned products.

For servicing procedures of this valve, refer to Group 9, "Engine".

CARBURETOR BBD 3684S

Dirt, dust, water and gummy deposits are some of the main causes for poor carburetor operation. Proper cleaning, however, and installation of new parts, where required, will return the carburetor to its originally designed performance.

When overhauling the carburetor, several items of importance should be observed to assure a good job. All parts (except the choke diaphragm) should be carefully cleaned in a suitable solvent and inspected for damage and wear. Replace questionable parts with new ones.

Use air pressure only, to clear the various orifices and passages.

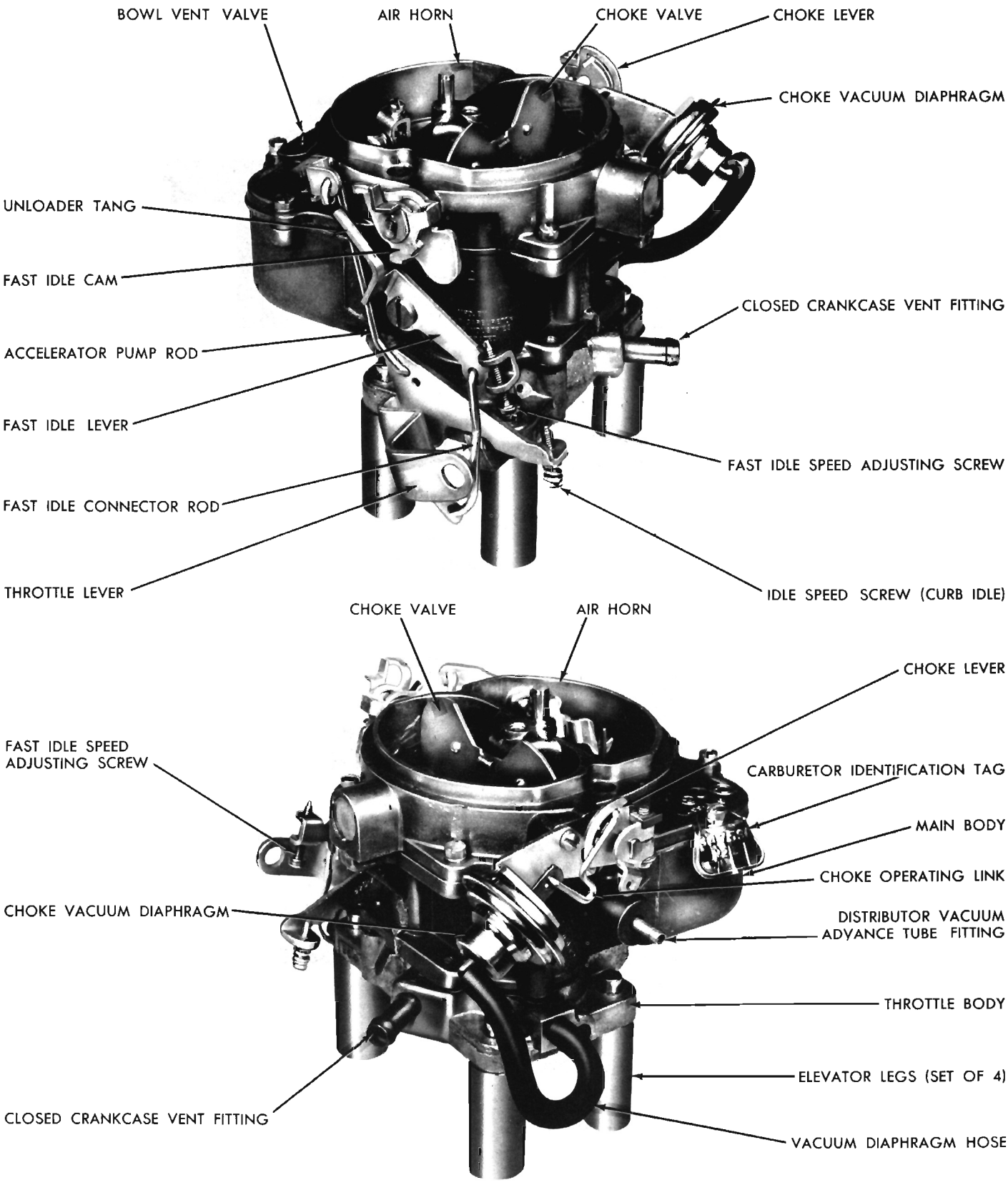


Fig. 1—Carburetor Assembly (BBD 3684S)

SERVICE PROCEDURES

1. CARBURETOR BBD-3684S

Disassembly (Fig. 1)

(1) Insert three elevating legs Tool T109-287S and one elevating leg Tool T109-288S through the carburetor throttle body stud holes (These tools are used to protect the throttle valves from damage and to provide a suitable base for working).

(2) Remove the hairpin clip and disengage the fast idle connector rod from the throttle and fast idle levers.

(3) Remove the hairpin clip and disengage the accelerator pump rod from the throttle lever and the pump rocker arm.

(4) Remove the vacuum hose between the carburetor throttle body fitting and the vacuum diaphragm.

(5) Remove the pin spring from the choke operating link and disengage the link from the diaphragm plunger (stem) and the choke lever. (Refer to Fig. 1).

(6) Remove the vacuum diaphragm and bracket assembly and place to one side, to be cleaned as a separate item. **A liquid cleaner may damage the diaphragm material.**

(7) Remove the air horn retaining screws and lift the air horn straight up and away from the main body. Discard the gasket (2 screws recessed).

(8) Disengage the accelerator pump plunger from the accelerator pump arm by pushing up on the bottom of the plunger and sliding the plunger shaft off the hook. Slide the plunger out of the air horn and remove the compression spring and seat.

If the old plunger can be used again or if a new plunger is to be installed, place the plunger in a jar of clean gasoline or kerosene to prevent the leather from drying out.

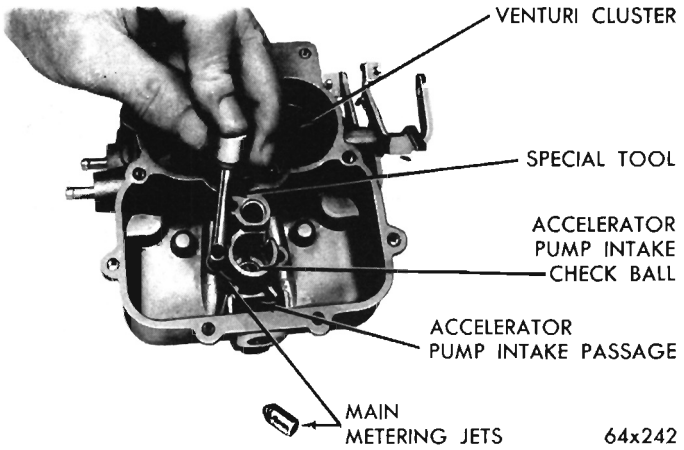


Fig. 3—Removing or Installing Main Metering Jets

(9) Remove the fuel inlet needle valve, seat and gasket from the main body.

(10) Lift out the float fulcrum pin retainer, and lift out the floats and fulcrum pin.

(11) Remove the step-up piston and retaining screw and slide the step-up piston and rods out of well, as shown in Figure 2. Lift out the step-up piston spring. Remove the step-up piston gasket from the bottom of the well.

(12) Remove the main metering jets and gaskets, as shown in Figure 3.

(13) Remove the venturi cluster screws, then lift the venturi cluster and gaskets up and away from the main body, as shown in Figure 4. Discard the gaskets.

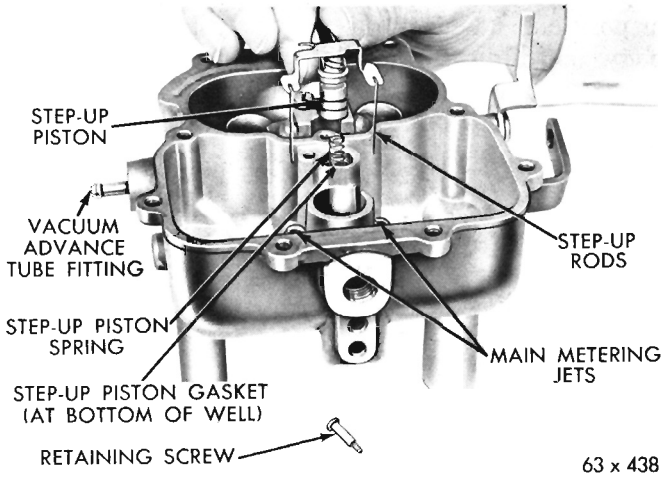


Fig. 2—Removing or Installing Step Up Piston

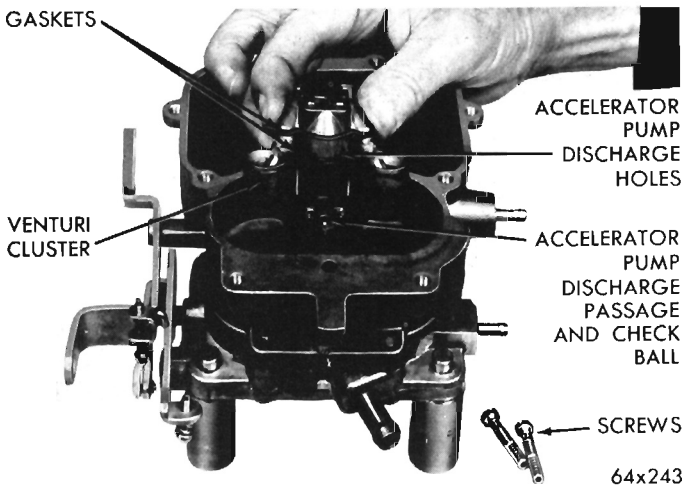


Fig. 4—Removing or Installing Venturi Cluster

NOTE: Do not remove the idle orifice tubes or the main vent tubes from the cluster. They can be cleaned in a solvent and dried with compressed air.

(14) Invert the carburetor and drop out the accelerator pump discharge check ball.

(15) Remove the idle mixture adjusting screws and springs from the throttle body.

(16) Remove the screws that attach the throttle body to the main body. Separate the bodies and discard the gasket.

The carburetor now has been disassembled into three sub-assemblies, the air horn, main body and throttle body and the components of each disassembled as far as necessary for cleaning and inspection.

It is usually not advisable to remove the throttle shaft or valves from the throttle body, unless wear or damage necessitates the installation of new parts.

Cleaning the Carburetor Parts

The recommended solvent for gum deposits is denatured alcohol which is easily obtainable. However, there are other commercial solvents which may be used with satisfactory results.

The choke diaphragm can be damaged by solvents. Avoid placing the diaphragm assembly in **ANY** liquid. Clean the external surfaces with a clean cloth or soft wire brush. Shake dirt or other foreign material from the stem side of the diaphragm. Depressing the diaphragm plunger (stem) to the retracted position, will provide an additional hole for the removal of dirt. Compressed air can be used to remove loose dirt **but should not be connected to the vacuum inlet fitting.**

IMPORTANT: If the commercial solvent or cleaner recommends the use of water as a rinse it should be "HOT". After the rinsing, all trace of water must be blown from the passages with air pressure. It is further advisable to rinse all parts in clean kerosene or gasoline to be certain no trace of moisture remains. Never clean jets with a wire, drill or other mechanical means, because the orifices may become enlarged, making the mixture too rich for proper performance.

Inspection and Reassembly— Throttle Body

(1) Inspect the throttle shaft and throttle body for excessive wear. If either or both are worn to the point where the carburetor operation will be affected, replace as required.

During manufacture, the location of the idle transfer port and the spark advance control ports to the throttle valve, is carefully established for one particular assembly. (Refer to Figure 5.)

If a new shaft should be installed in an old worn throttle body, it would be very unlikely that the original relationship of the ports to the valves would be obtained. Changing the relationship of the valves to the ports would adversely affect normal vehicle operation between the speeds of 15 and 30 miles per hour. If it has been determined, however, that a new shaft or valve is to be installed, adhere to the following instructions.

(2) Mark the position of the throttle valves in the bores. Be sure the idle speed screw is backed off.

(3) Remove the screws that hold the throttle valves to the shaft and slide the valves out of the bores.

NOTE: These screws are staked on the opposite side and care should be used at removal so as not to break off in the shaft. Remove the staked end of the screws with a file.

(4) Slide the throttle shaft and lever out of the body.

(5) Install a new throttle shaft and lever.

(6) Install the throttle valves in their respective bores (with the valve numbers toward the manifold). Install new screws but do not tighten. Hold the valves in place, with the fingers pressing on the high sides of the valves. Tap the valves lightly with a screw driver to seat in the throttle bores. Tighten the screws securely and stake by squeezing with pliers.

(7) Install the idle mixture screws and springs in the throttle body. (The tapered portion must be straight and smooth. If the tapered portion is grooved or ridged, new idle mixture screws should be installed to insure having correct idle mixture control.) **Do Not Use a Screw Driver.** Turn the screws **lightly** against their seats with the fingers. Back off one full turn for approximate adjustment.

Main Body

(1) Invert the main body and place a new gasket in position and place the throttle body on the main body and align. Install screws and tighten securely.

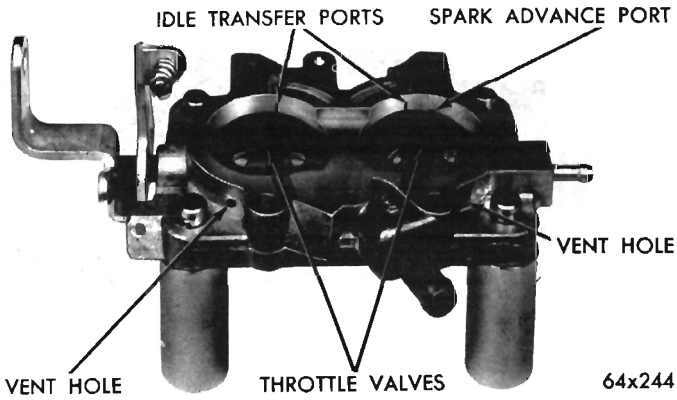


Fig. 5—Ports in Relation to Throttle Valves

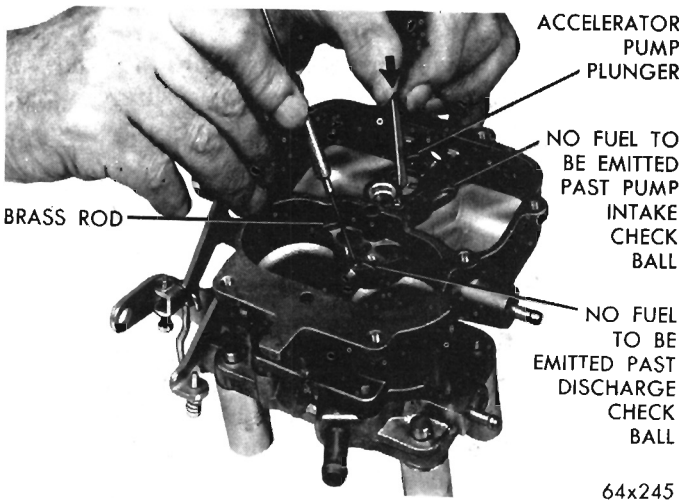


Fig. 6—Testing Accelerator Pump Intake and Discharge Check Balls

(2) Install the accelerator pump discharge check ball in the discharge passage and test the accelerator pump system; fuel inlet and discharge check balls as follows:

(3) Pour clean gasoline into the carburetor bowl, approximately ½ inch deep. Remove the pump plunger from the jar of gasoline, flex the leather several times, then silde it down into the pump cylinder. Raise the plunger and press lightly on the plunger shaft to expell all air from the pump passage.

(4) Using a small clean brass rod, hold the discharge check ball down firmly on its seat. Again raise the plunger and press downward. No fuel should be emitted from either the intake or discharge passage, as shown in Figure 6.

If any fuel does emit from either passage, it indicates the presence of dirt or a damaged check ball seat. Retest the passage again and repeat the test. If leakage is still evident, install a new check ball. The fuel inlet check ball is located at the bottom of the plunger well.

(5) Install new gaskets on the venturi cluster, and install in position in the main body. Install the cluster screws and tighten securely. Test pump discharge by pressing pump plunger down. Two fine streams of fuel should be forced from the cluster. If either stream is restricted or diverted, remove cluster and reclean. After test, pour the fuel from the bowl and remove the pump plunger.

(6) Install the main metering jets and gaskets. Tighten securely. (Refer to Fig. 3.)

(7) Before installing the step-up piston, be sure the step-up rods are able to move freely, each side of the vertical position, as shown in Figure 7. The step-up rods must be straight and smooth.

(8) Slide the step-up piston gasket down into position in the piston well, then install the step-up piston spring, step-up piston and rods. Carefully guide the step-up rods into the main metering jets (Fig. 2.) Install the retaining screw and tighten securely. Test the piston for free operation in the well.

Install the retaining screw and tighten securely. Test the piston for free operation in the well.

A step-up piston stuck in the **Up** position will cause a rich mixture at part throttle; a piston stuck in the **Down** position will cause a lean mixture at wide open throttle and poor acceleration.

Measuring the Float Setting

The carburetors are equipped with a rubber-tipped fuel inlet needle. The rubber tip is flexible enough to make a good seal on the needle seat, and to give increased resistance to flooding.

The use of the rubber tipped needle requires care to perform the float setting operation accurately in order to secure the best performance and fuel economy.

(1) To correctly set the float height when the carburetor is being overhauled, install the floats with the fulcrum pin and pin retainer in the main body.

(2) Install the rubber-tipped needle, seat and gasket in the body and tighten securely.

(3) Invert the main body so that the weight of the float only is forcing the needle against the seat. Hold a finger against the retainer to fully seat the fulcrum pin.

(4) Using Tool T109-282, or a "T" scale, measure the float, as shown in Figure 8. There should be $\frac{5}{16}$ inch from the surface of the fuel bowl to the **crown of each float at the center.**

If an adjustment is necessary, hold the floats on

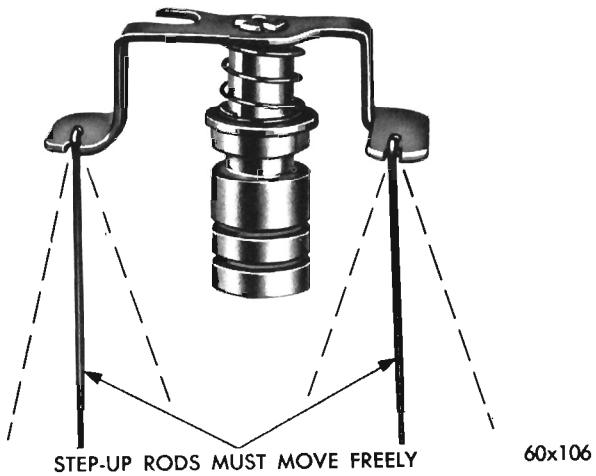


Fig. 7—Step Up Rods Free Play

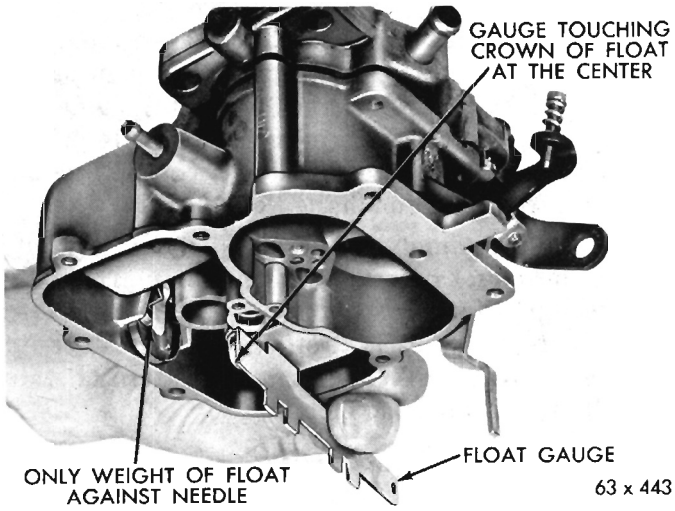


Fig. 8—Measuring the Float Setting

the bottom of the bowl and bend the float lip toward or away from the needle. Reset the $\frac{5}{16}$ inch setting again and repeat the lip bending operation as required.

CAUTION: When bending the float lip, do not allow the lip to push against the needle as the synthetic rubber tip can be compressed sufficiently to cause a false setting which will affect correct level of fuel in the bowl. After being compressed, the tip is very slow to recover its original shape.

It is very important that the float lip be perpendicular to the needle or slanted not more than ten degrees away from the needle when the float height is correct.

Air Horn

(1) Test the freeness of the choke mechanism in the air horn. The choke shaft must float free to operate correctly. If the choke shaft sticks in the bearings, or appears to be gummed from deposits in the air horn, a thorough cleaning will be required.

(2) Remove the accelerator pump plunger from the gasoline, slide the compression spring and spring seat over the shaft. Install the assembly in the air horn and engage with the accelerator pump arm.

(3) Place a new gasket on the main body, and install the air horn. Install attaching screws and tighten securely. (When installing the air horn, be sure the leather on the plunger does not wrinkle or fold back).

(4) Engage the accelerator pump rod with the pump rocker arm and install the loose end in the center hole of throttle level. Install the hairpin clip to secure.

(5) Engage the fast idle connector rod in the fast idle lever and throttle lever. Install the hairpin clip to secure.

Installing the Vacuum Diaphrgam

(1) Install the diaphragm assembly on the air horn and tighten the attaching screws securely.

(2) Install the choke operating link in position between the diaphragm plunger (stem) and the choke lever. Install the pin spring to secure.

(3) Inspect the vacuum diaphragm fitting and remove any dirt or foreign material which could plug the passage. Inspect the rubber hose for cracks, before placing it on the correct fitting. (Refer to Fig. 1.)

Do not connect the vacuum hose to the diaphragm fitting until after the vacuum kick adjustment has been made. (See Carburetor Adjustments.)

2. CARBURETOR ADJUSTMENTS

It is very important that the following adjustments are made on a reconditioned carburetor and in the sequence listed:

Accelerator Pump

(1) Back off the idle speed adjusting screw. Open the choke valve so that the fast idle cam allows the throttle valves to be completely seated in the bores. Be sure that the pump connector rod is installed in the center hole of the throttle lever.

(2) Close the throttle valves tightly. Measure the distance between the top of the air horn and the end of plunger shaft, as shown in Figure 9. This measurement should be 1" + or — $\frac{1}{64}$ inch.

(3) To adjust the pump setting, bend the pump connector rod, using Tool T109-213, at the lower angle of rod, until the correct travel has been obtained.

Fast Idle Speed and Cam Position Adjustment

The fast idle engine speed adjustment should be

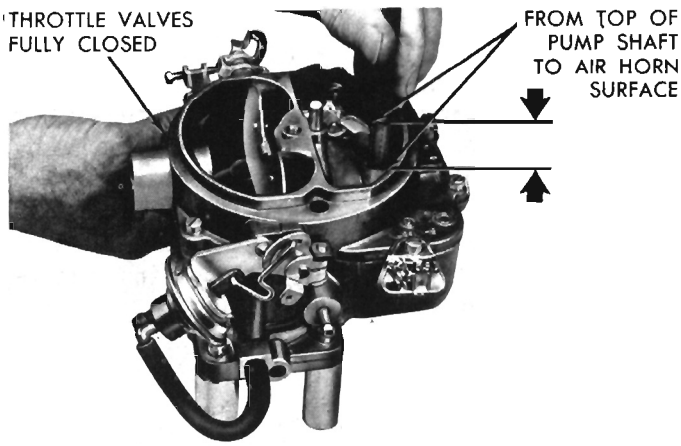


Fig. 9—Measuring Accelerator Pump Travel

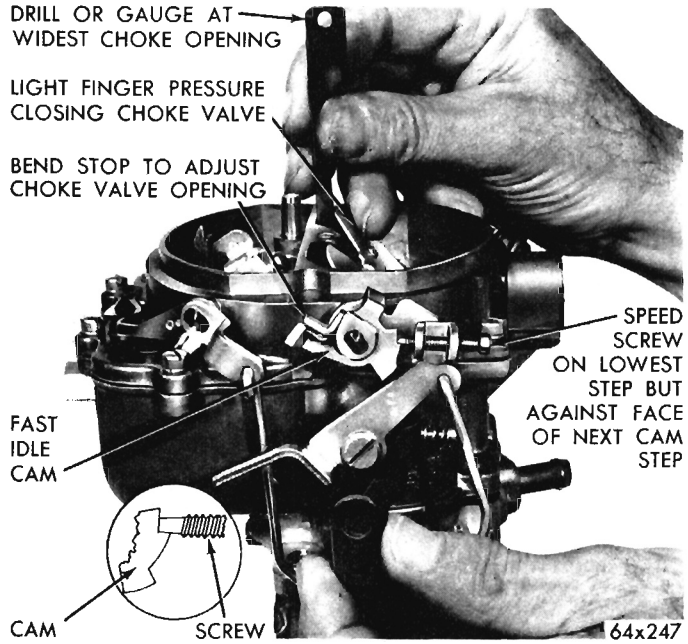


Fig. 10—Fast Idle Cam Position Adjustment

made on the car, as described in the paragraph "Fast Idle Speed Adjustment". However, the Fast Idle Cam Position Adjustment can be made on the bench.

(1) With the fast idle speed adjusting screw contacting the lowest step on the fast idle cam, as shown in Figure 10, move the choke valve toward the closed position with light pressure. Insert a $^{15}/_{64}$ inch drill or gauge between the choke valve and the wall of the air horn.

(2) An adjustment will be necessary if a slight drag is not obtained as the drill or gauge is being removed.

(3) If an adjustment is necessary, bend the stop on the choke shaft, using Tool T109-22 until the correct valve opening has been obtained. (Refer to Fig. 10).

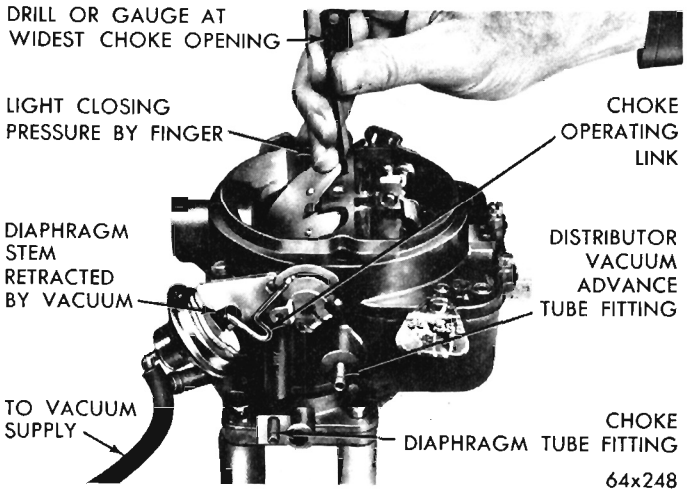


Fig. 11—Measuring the Choke Vacuum Kick Setting

Vacuum Kick Adjustment—(This test can be made **On** or **Off** the vehicle).

To make the vacuum kick adjustment, the vacuum diaphragm must be energized (either a distributor testing machine with a vacuum source, or vacuum supplied by another vehicle).

(1) With the engine **Not** running, open the throttle valves far enough to allow the choke valve to be moved to the closed position.

(2) Disconnect the vacuum hose from the diaphragm and connect the hose from the vacuum supply, as shown in Figure 11. (A minimum of 10 inches of mercury (HG) will be required).

(3) Insert a $^{11}/_{64}$ inch drill or gauge between the choke valve and the wall of the air horn. (Refer to Fig. 11). Apply a slight closing pressure to the choke shaft to hold the drill or gauge in position.

(4) An adjustment will be necessary if a slight drag is not obtained as the drill or gauge is being removed.

The adjustment of this opening will require the removal of the choke operating link.

CAUTION: Damage to the diaphragm and the choke lever slot can result, if the link is not removed for the bending operation.

(5) Remove the pin spring and disengage the choke operating link from the diaphragm stem (plunger), then disengage the link from the choke lever. (The best bending results will be obtained by using a vise and a pair of pliers).

(6) Bend the choke operating link at the angle to provide the correct choke valve opening.

CAUTION: A correction in the length of the link of .010 inch, will result in a change of .015 inch in the choke valve opening.

(7) Bend the choke operating link to provide the correct choke valve opening. (A correction in the length of the link of .010 inch, will result in a change of .010 inch in the choke valve opening).

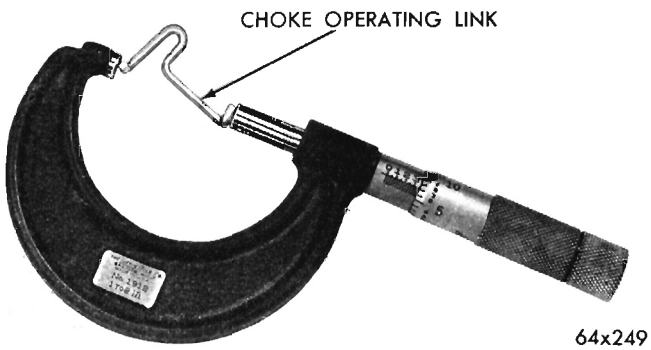


Fig. 12—Choke Operating Link Measurements

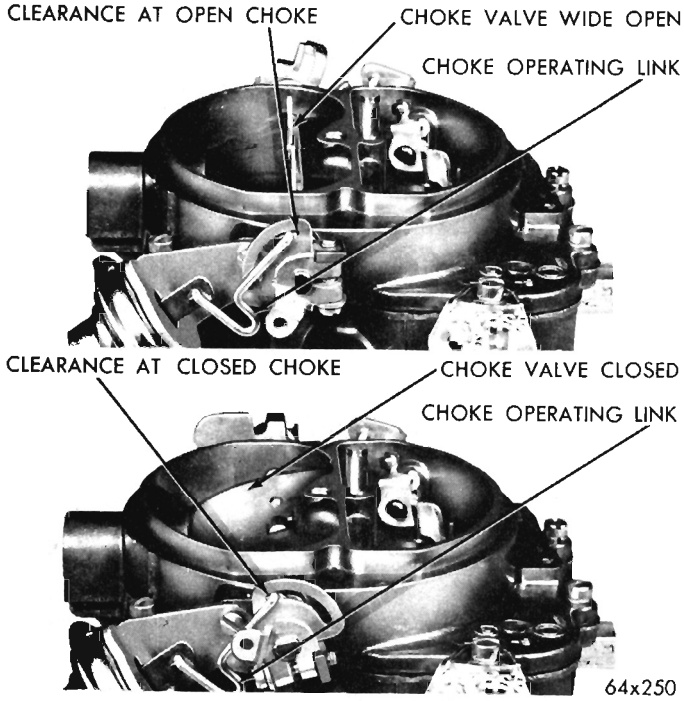


Fig. 13—Choke Operating Link Clearances

As an example, if the choke valve opening is .010 inch in error, the correction in the link length would be .010 inch.

A "2" inch micrometer will be helpful in establishing the original length of the link, as shown in Figure 12, before completing the adjustment.

(8) Install the choke operating link and recheck the choke valve opening, using a gauge or drill. (Refer to Figure 11).

Reinstall the vacuum hose to the diaphragm fitting and make the following test:

(9) With no vacuum applied to the diaphragm,

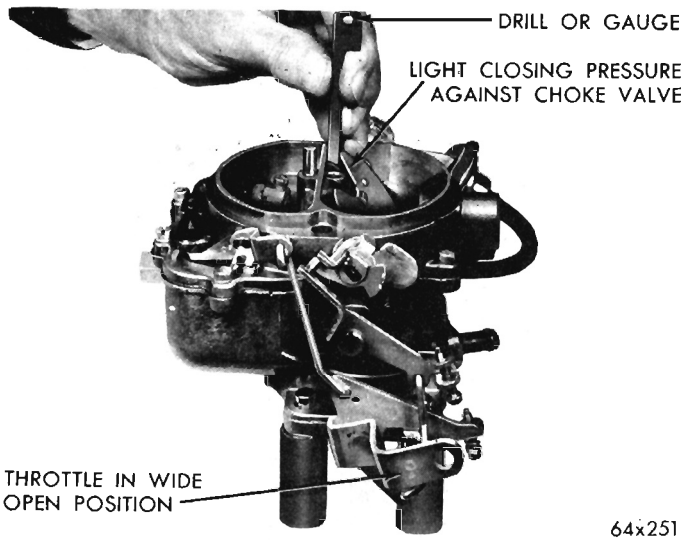


Fig. 14—Measuring Choke Unloader Setting (Wide Open Kick)

some clearance should exist between the choke operating link and the choke lever slot, in both the open and closed choke valve positions, as shown in Figure 13.

NOTE: This clearance is necessary to allow the choke valve to close for starting as well as fully open after the engine reaches the normal operating temperature.

If a clearance does not exist in both of these positions, a recheck of the operating link adjustment should be made.

NOTE: Free movement of the choke valve between the closed and open positions is very necessary.

This free movement should also exist between the kick and the open choke valve positions with the engine running. If binding does exist, the choke operating link has been improperly bent and should be corrected.

Choke Unloader (Wide Open Kick)

(1) Hold the throttle valves in the wide open position. Insert Tool T109-31 (or a ¼" drill shank) between the upper edge of the choke valve and the inner wall of the air horn, as shown in Figure 14.

(2) With a finger lightly pressing against the valve, a slight drag should be felt as the gauge is being withdrawn. If an adjustment is necessary, bend the tang on the fast idle lever, using Tool T109-22, as shown in Figure 15 until the correct clearance has been obtained.

Bowl Vent Adjustment

(1) With the throttle valves at curb idle, there should be 1/16 inch clearance between the bowl vent valve and the air horn, when measured (at the center of the vent valve and the seat) with a gauge or drill shank.

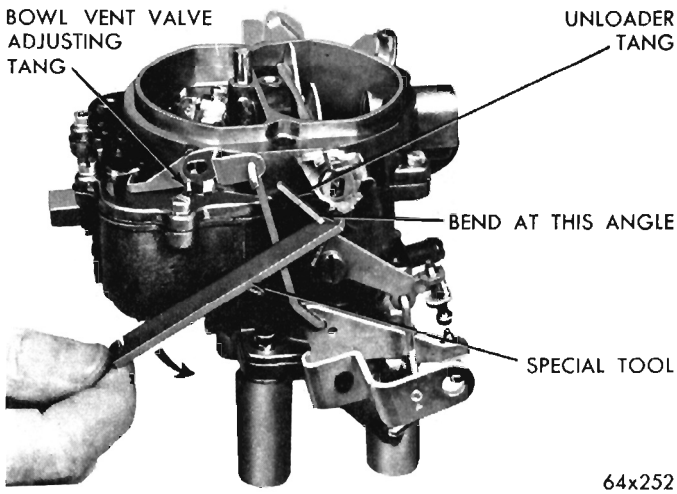


Fig. 15—Bending the Unloader Tang

(2) If an adjustment is necessary, bend the short tang on the vent valve operating lever, using Tool T109-22 until the correct clearance has been obtained. (Refer to Fig. 15).

Idle Speed Adjustment (Curb Idle)

To make the idle speed adjustment, the engine must be thoroughly warmed up. A more reliable idle adjustment can usually be obtained if the vehicle has been driven a minimum of five miles. For best results, it is recommended that a tachometer be used in this adjustment.

The following precautions should be taken before making the idle speed adjustment:

Because the alternator can charge at idle speeds and impose a load on the engine, the headlamps should be turned on the high beam. This will assure setting the idle to compensate for the alternator load.

On vehicles equipped with automatic transmission, loosen the nut in the sliding link of the carburetor to bellcrank rod so that the stop in the transmission will not interfere with the free movement of the carburetor throttle lever.

(1) To make the idle speed adjustment, turn the idle speed screw in or out to obtain 500 rpm. (On cars with air conditioning, set the idle speed at 500 rpm, **with air conditioning on).** Be sure the choke valve is fully open and that the fast idle adjusting screw is not contacting the fast idle cam.

(2) Turn each idle mixture screw in or out to obtain the highest rpm. While making the adjustment, carefully watch the tachometer and notice that the speed can be decreased by turning the screws in either direction from the setting that gave the highest rpm reading.

(3) Readjust to 500 rpm with the idle speed screw, with air conditioning ON.

(4) Turn each idle mixture adjusting screw in the clockwise direction (leaner) until there is a slight drop in rpm. Turn each screw out, counter-clockwise (richer) just enough to regain the lost rpm.

This procedure will assure that the idle has been set to the leanest mixture possible for smooth idle. **This setting is very important.**

Since the correct speed was originally set, using the speed screw, the speed obtained after finding the leanest smooth idle will probably be too fast.

(5) Readjust the speed screw to obtain the correct idle speed. Repeat steps 2 and 4 above if necessary.

After the proper idle speed has been obtained, move the sliding link to the rear against the stop and tighten the nut securely.

Float Setting (On the Vehicle)

(1) To measure the float setting with the carburetor mounted on the engine, remove the hairpin clip and disengage the accelerator pump rod from the throttle lever and the pump rocker arm. Disconnect the automatic choke rod by unsnapping the clip.

(2) Remove the air horn attaching screws and lift the air horn straight up and away from the main body. Remove the gasket.

(3) Set the float fulcrum pin by pressing a finger against the fulcrum pin retainer.

There should be enough fuel in the bowl to raise the floats so that the lip bears firmly against the needle. Additional fuel may be admitted by slightly depressing the float. If the fuel pressure in the line is insufficient to force the additional fuel into the bowl, add the necessary fuel from a clean container.

WARNING: Since the manifolds may be hot, it is dangerous to spill fuel onto these surfaces. Take the necessary precautions to avoid spillage.

(4) With only the pressure from the buoyant float holding the lip against the inlet needle, measure the float setting, using Tool T109-282, or a "T" scale. There should be $^{5}/_{16}$ inch from the surface of the bowl (gasket removed) to the crown of the floats at the center.

If an adjustment is necessary, hold the floats on the bottom of the bowl, then bend the float lip toward or away from the needle. Recheck the $^{5}/_{16}$ inch setting again, then repeat the lip bending operation as required.

NOTE: When bending the float lip, do not allow the lip to push against the needle as the rubber tip can be compressed sufficiently to cause a false setting which will affect correct level of fuel in the bowl.

After being compressed, the rubber tip is very slow to recover its original shape. It is very important that the float lip be perpendicular to the needle or slanted not more than 10 degrees away from the needle when the float is set correctly.

(5) After the float has been correctly set, reassemble the air horn.

Fast Idle Speed Adjustment (On the Vehicle)

To set the fast idle speed on the vehicle, connect a tachometer to the vehicle, then set the curb idle speed.

(1) With the engine running and the transmission in the neutral position, open the throttle slightly.

(2) Close the choke valve about 20 degrees then

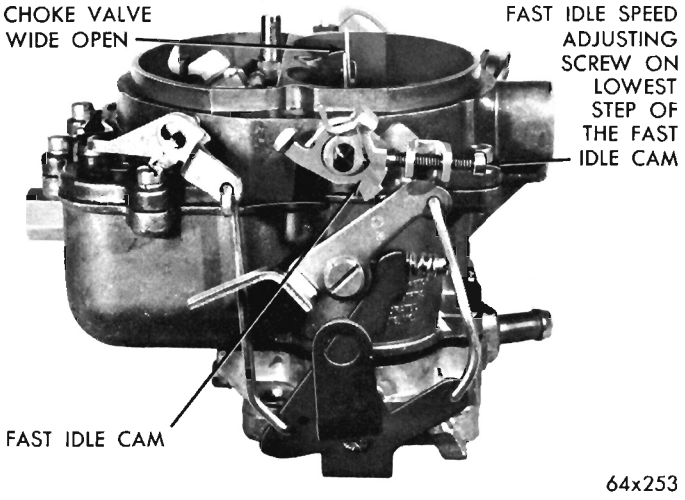


Fig. 16—Fast Idle Speed Adjustment (On the Car)

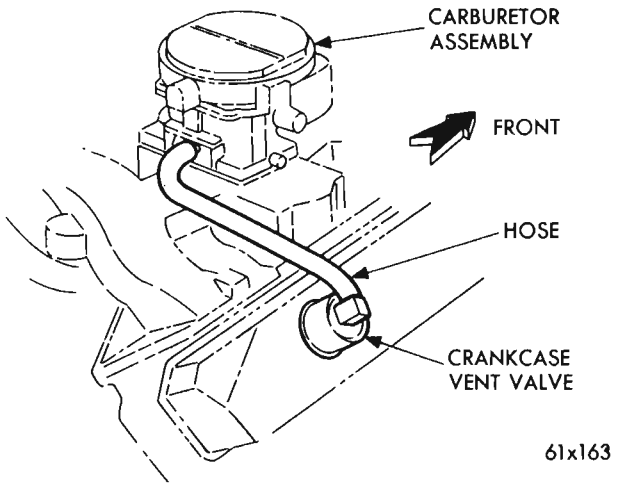


Fig. 17—Closed Crankcase Vent System

allow the throttle to close. Return the choke valve to the open position.

(3) The fast idle speed adjusting screw should contact the lowest step on the fast idle cam, as shown in Figure 16.

(4) With the engine warmed-up to the normal operating temperature, turn the fast idle speed adjusting screw **in** or **out** to secure 700 rpm. **Reposition the cam and throttle after each screw adjustment.**

3. AUTOMATIC CHOKE—WELL TYPE

To function properly, it is important that all parts be clean and move freely. Other than an occasional cleaning, the choke requires no servicing. It is very important, however, that the choke control unit work freely in the well and at the choke shaft.

Move the choke rod up and down to check for free movement on the pivot. If the unit binds, a new choke unit should be installed. The Well Type Choke Unit is serviced as an assembly. Do not attempt to repair or change the index setting.

When installing the well type choke unit, be certain that the coil housing does not contact the sides of the well in the intake manifold. Any contact at this point will affect choke operation.

Do not lubricate any parts of the choke or the control unit. This causes an accumulation of dirt which will result in binding of the choke mechanism.

4. CLOSED CRANKCASE VENT SYSTEM

The closed crankcase ventilator valve is located in the crankcase vent tube cap and is connected to the carburetor throttle body with a rubber tube. (See Fig. 17).

The function of the valve is to control the unburned fuels that originate in the crankcase. The gases are returned to the intake manifold, fed back into the combustion chambers and then expelled out through the exhaust system as completely burned products.

For servicing procedures of this system, refer to Group 9, "Engine".

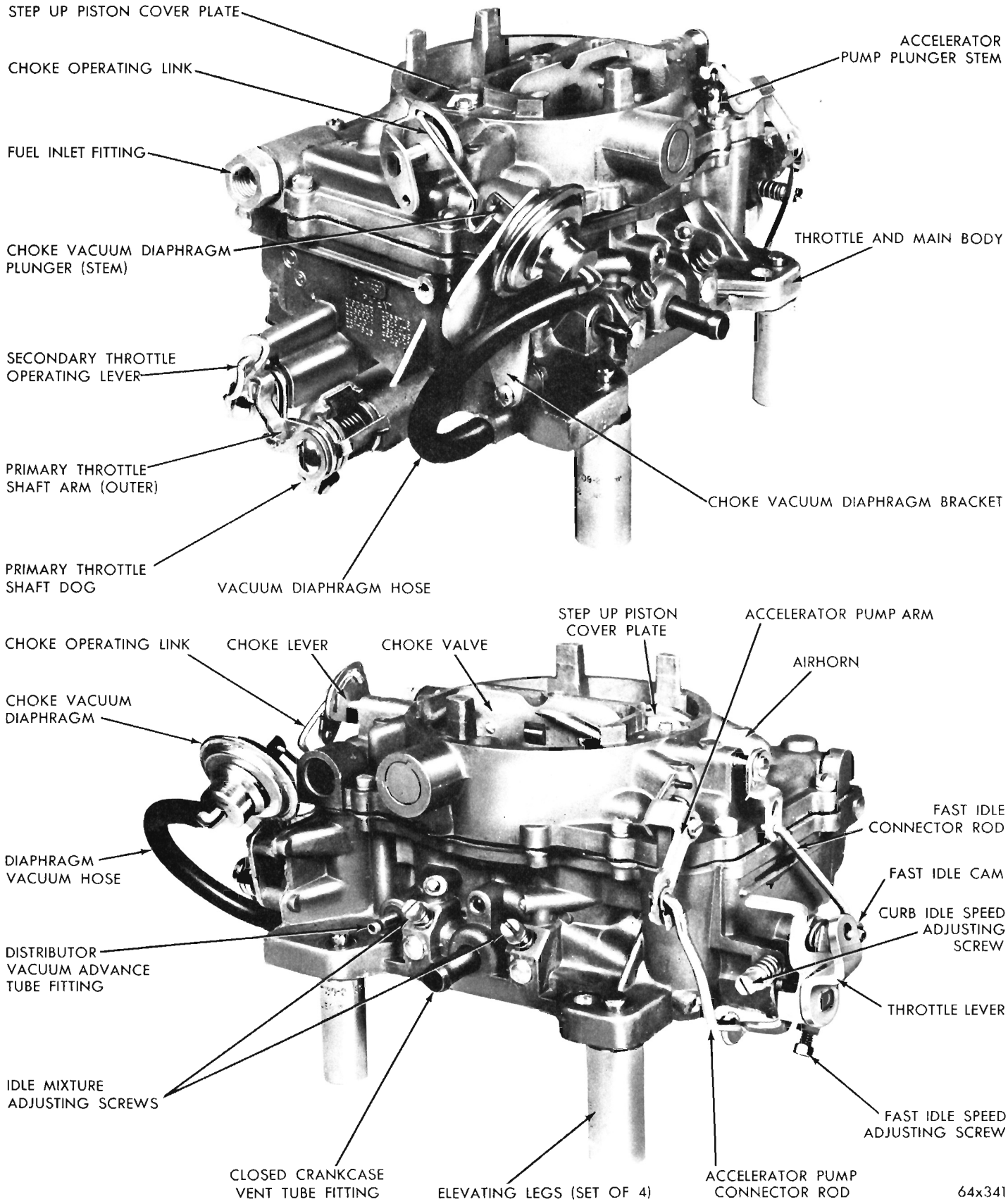


Fig. 1—Carburetor Assembly (AFB-3611S)

PART 4

CARBURETOR (AFB SERIES)

The AFB (aluminum four barrel) carburetor contains many features, some of which are the locations for the step-up rods and pistons. The step-up rods, pistons and springs are accessible for service without removing the air horn or the carburetor from the engine. The venturi assemblies (primary and secondary) are replaceable and contain many of the calibration points for both the high and low speed system. One fuel bowl feeds both the primary and secondary nozzles on the right side while the other fuel bowl takes care of the primary and secondary nozzles on the left side. This provides improved performance in cornering, quick stops and acceleration.

All the major castings of the carburetor are aluminum, with the throttle body cast integral with the main body. This allows an overall height reduction in the carburetor. The section containing the accelerator pump is termed the primary side of the carburetor. The rear section is the secondary. The five conventional systems used in previous four barrel carburetors are also used in this unit. The five conventional systems are, two float systems, two low speed systems, (primary side only), two high speed systems, one accelerator pump system and one automatic choke control system.

SERVICE PROCEDURES

1. SERVICING THE CARBURETOR

Dirt, dust, water and gummy deposits are some of the main causes for poor carburetor operation. However, proper cleaning and the installation of new parts, where required, will return the carburetor to its originally designed performance.

When overhauling the AFB Carburetor, several items of importance should be observed to assure a good job.

The carburetor should be carefully disassembled.

All parts (except the choke diaphragm assembly) should be cleaned in a suitable solvent, then inspected for wear or damage.

Air pressure only should be used to clean the various orifices and channels.

Questionable parts should be replaced with new ones. When inspecting parts removed from the carburetor, it is at times rather difficult to determine if they are satisfactory for further service. It is recommended therefore, in such cases, that **new** parts be installed.

2. DISASSEMBLING THE CARBURETOR (Fig. 1)

(1) Place the carburetor assembly on the repair stand Tool C-3400 or T109-287S elevating legs. These tools are used to protect the throttle valves from damage and to provide a suitable base for working.

(2) Remove the hairpin clip that attaches the fast idle connector rod to the choke lever. Disengage the rod from the lever, then swing the rod at an arc until it can be disengaged from the fast idle cam.

(3) Remove the clevis clip that holds the throttle connector rod in the center hole of the accelerator pump arm. Remove the hairpin clip that attaches the lower end of the rod in the primary throttle shaft lever. Disengage the rod from the arm and lever, then remove from the carburetor.

(4) Remove the vacuum hose between the carburetor throttle body and the vacuum diaphragm.

(5) Remove the hairpin clip from the choke operating link and disengage the link from the diaphragm plunger (stem) and the choke lever. (Refer to Fig. 1).

(6) Remove the vacuum diaphragm and bracket assembly and place to one side to be cleaned as a special item. **A liquid cleaner other than mineral spirits, may damage the diaphragm material.**

(7) Remove the screws attaching the step-up piston and the rod cover plates. **Hold the cover down with a finger to prevent the piston and rods from flying out.** Lift off the plates and slide the step-up pistons and rods out of the air horn, as shown in Figure 2. Remove the step-up piston springs.

(8) Remove the ten screws that attach the air horn to the main body. (1 screw in hole in air horn.) Lift air horn straight up and away from the main body. **When removing the air horn, use care so as not to bend or damage the floats.** Remove the accelerator pump and plunger lower spring from the pump cylinder.

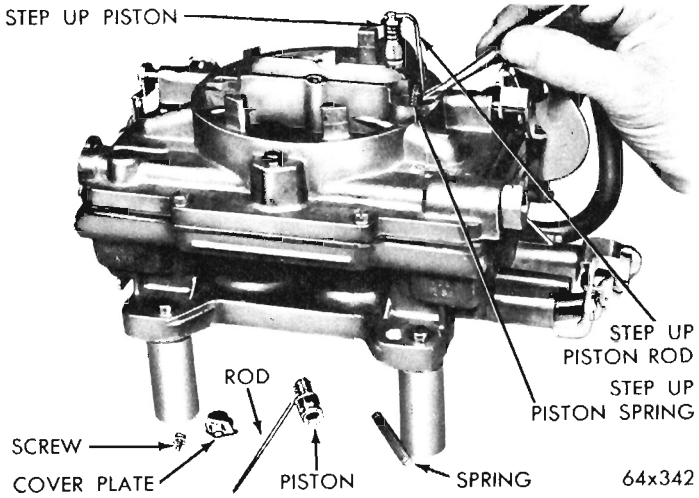


Fig. 2—Removing or Installing Step Up Pistons and Rods

Disassembling the Air Horn

Place the air horn in an inverted position on the bench (to protect the floats) then proceed to disassemble as follows:

(1) Using a suitable Tool, remove the float fulcrum pins (left and right) then lift the floats up and out of the bosses on the air horn. **It is suggested that the float on the pump side be marked so that the floats can be re-installed in their respective positions.**

(2) Remove the two needle valves from their respective seats, after marking the one on the pump side for identification. Using a wide blade screw driver, remove the needle valve seats. Be sure each needle valve is returned to its original seat at reassembly.

(3) Remove the spring clip that holds the throttle connector rod in the center hole of the pump arm. Remove the pump arm pivot screw and lift off the pump arm, at the same time, disengage the link from the arm and the pump stem. Slide the accelerator pump plunger and spring out of the air horn. Remove gasket.

(4) Place the accelerator pump plunger in a jar of clean gasoline or kerosene, to prevent the leather from drying out.

(5) Remove the fuel inlet fitting and filter screen from the air horn.

(6) Test the freeness of the choke mechanism in the air horn. The choke shaft must float free to operate correctly. If the choke shaft sticks in the bearings, or appears to be gummed from deposits in the air horn, a thorough cleaning will be required.

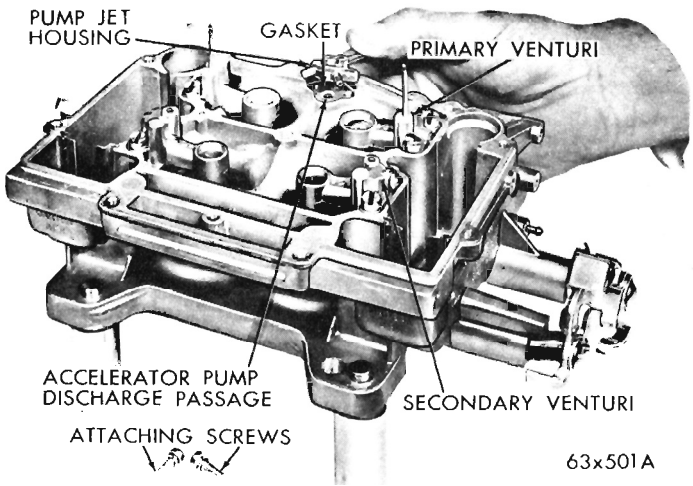


Fig. 3—Removing or Installing Accelerator Pump Jet Housing

Main Body Disassembly

(1) Remove the screws that attach the accelerator pump jet housing to the main body. Lift out the jet housing and gasket, as shown in Figure 3. Discard the gasket. Invert the main body and drop out the discharge check needle from the discharge passage.

(2) Using Tool T109-58, remove the main metering jets (primary side), as shown in Figure 4.

NOTE: The primary and secondary main metering jets are not interchangeable. It is very important that these jets be installed in the respective locations in the main body at reassembly.

(3) Again using Tool T109-58, remove the main metering jets (secondary side), as shown in Figure 4.

(4) Remove the screws that attach the primary venturi (choke and pump side) to the main body. Lift the venturi straight up and away from the main body, as shown in Figure 5. Discard the gaskets.

NOTE: The venturi assemblies are not inter-

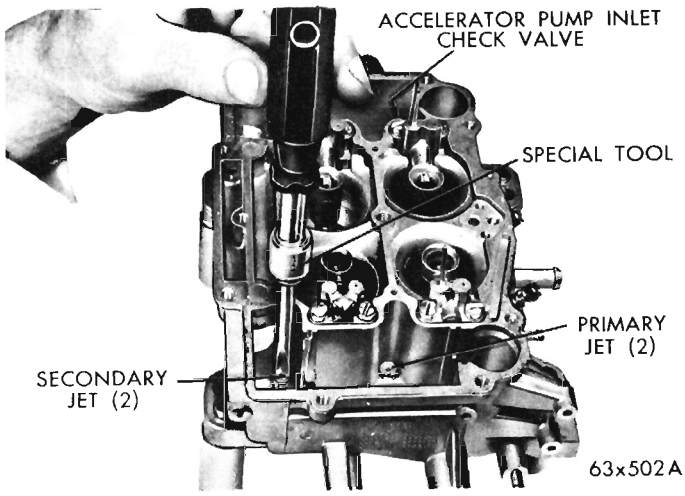


Fig. 4—Removing or Installing Main Metering Jets

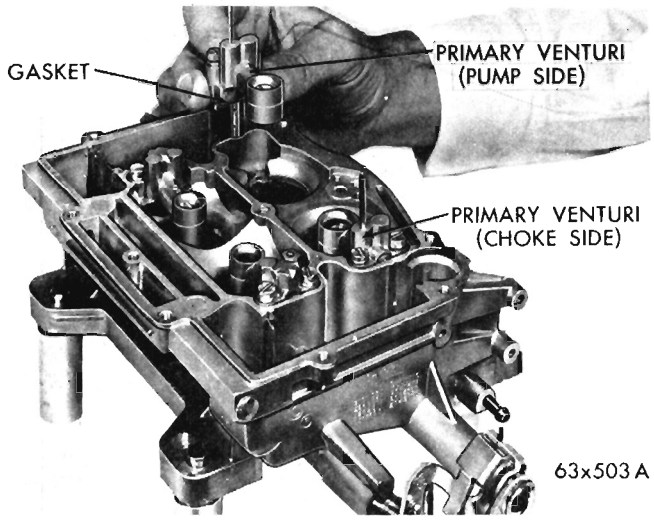


Fig. 5—Removing or Installing Primary Venturi

changeable, side for side and must be reinstalled in their original locations at reassembly.

(5) Remove the screws that attach the secondary venturi (choke and pump side) to the main body. Lift the secondary venturi assemblies straight up and away from the body, as shown in Figure 6.

(6) Using Tool T109-59, screw driver bit, remove the accelerator pump intake check valve located inside the fuel bowl, adjacent to the accelerator pump cylinder.

(7) Remove the two idle mixture adjusting screws and springs from the throttle body portion of the main casting.

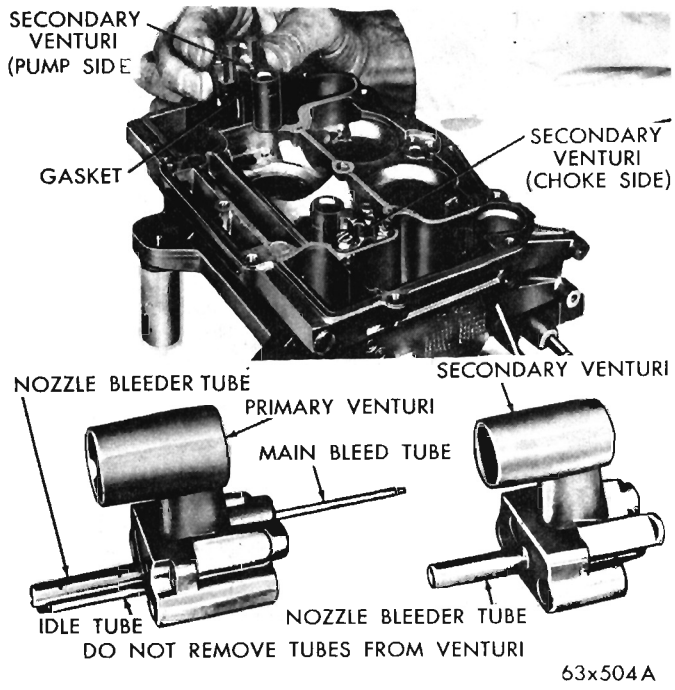


Fig. 6—Removing or Installing Secondary Venturi

The carburetor now has been disassembled into two units, namely the air horn and the main and throttle body casting. The component parts of each have been disassembled as far as necessary for cleaning and inspection.

It is usually not advisable to remove the throttle shafts or valves, unless wear or damage necessitates the installation of new parts. During the manufacture of the carburetor, the location of the idle transfer ports and the idle discharge ports to the valve is carefully established for one particular assembly, as shown in Figure 7. The valves are milled to give the proper port relation.

If new throttle shafts should be installed in an old worn body, it would be very unlikely that the original relationship of these ports to the valves would be obtained. A very slight change in the port relationship to the valves would adversely affect normal carburetor operation, between the speeds of 15 and 30 miles per hour.

It is recommended that if the throttle shafts are excessively worn, that a new carburetor be installed. However, if the throttle valves have become nicked, burred or damaged, new valves may be installed, providing the following instructions are carefully followed:

CAUTION: The screws that attach the throttle valves are staked on the opposite side and care should be used in removal so as not to break the screws in the throttle shaft. Remove the staked portion of the screws with a file.

Remove the screws that attach the primary throttle valves to the throttle shaft and slide valve (or valves) out of the bores.

Remove the screws that attach the secondary throttle valves to the throttle shaft and slide valve (or valves) out of the bores.

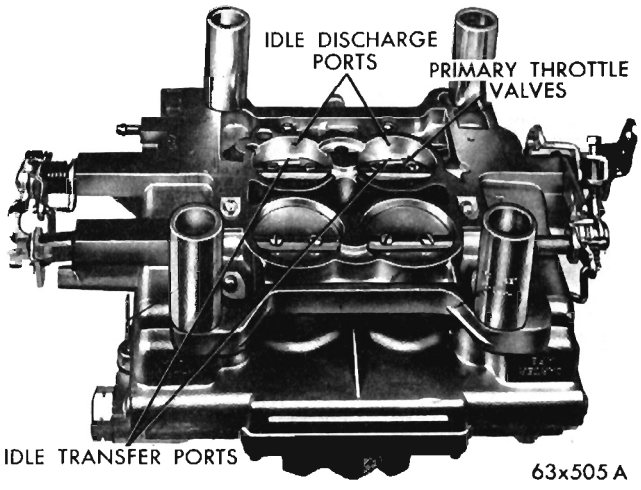


Fig. 7—Ports in Relation to Throttle Valves

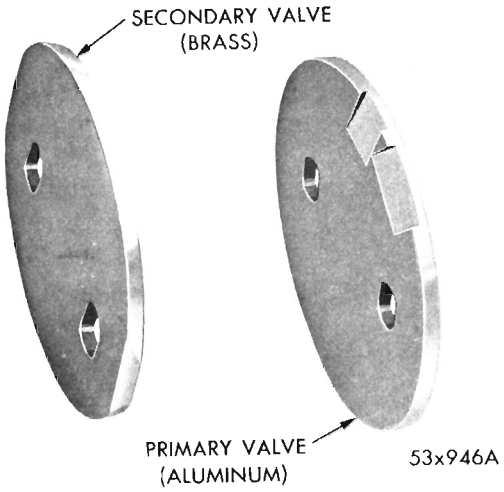


Fig. 8—Throttle Valve Identification

The primary valves and secondary valves are not interchangeable and should be kept separate in order that each may be returned to its respective bore. (See Fig. 8).

3. CLEANING THE CARBURETOR PARTS

The recommended solvent for gum deposits is denatured alcohol, which is easily obtainable. However, there are other commercial solvents which may be used with satisfactory results.

The choke diaphragm can be damaged by solvents. Avoid placing the diaphragm assembly in **ANY** liquid. Clean the external surfaces with a clean cloth or soft wire brush. Shake dirt or other foreign material from the stem side of the diaphragm. Depressing the diaphragm stem to the retracted position, will provide an additional hole for the removal of dirt. Compressed air can be used to remove loose dirt, **but should not be connected to the vacuum inlet fitting.**

IMPORTANT: If the commercial solvent or cleaner recommends the use of a water rinse, it should be "HOT". After rinsing, all trace of water must be blown from the passages with air pressure. It is further advisable to rinse all parts in clean kerosene or gasoline to be certain no trace of moisture remains. Never clean jets with a wire, drill or other mechanical means, because the orifices may become enlarged, making the mixture too rich for proper performance.

Inspection and Reassembly

(1) Slide the primary throttle valve (or valves) into their respective bores, install new screws, but do not tighten. Be sure the idle speed adjusting screw is backed out. Hold the valves in place with the fingers. (Fingers pressing on the high side of valves).

(2) Tap the valves lightly in this position, tighten screws securely. Stake screws by squeezing with pliers.

(3) Install the two idle mixture adjusting screws and springs in the throttle body portion of the casting. The tapered portion must be straight and smooth. If the tapered portion is grooved or ridged, a new idle mixture adjusting screw should be installed to insure having correct idle mixture control. **Do not use a screw driver.** The adjustment should be made with the fingers. Turn the idle mixture adjusting screws lightly against their seats, then back off one full turn for an approximate adjustment.

(4) Place new secondary venturi gaskets in position, then install the secondary venturi (pump and choke side) by lowering straight down on gaskets. Install attaching screws and tighten securely.

NOTE: Be sure all the metering holes and vent tubes are clean, in both the primary and secondary venturi.

(5) Place new primary venturi gaskets in position, then install the primary venturi (pump and choke side) by lowering straight down on the gaskets. (Refer to Fig. 5). Install attaching screws and tighten securely.

(6) Install the primary and secondary main metering jets, using Tool T109-58. (Refer to Fig. 4). Tighten jets securely.

(7) Install the accelerator pump intake check ball, using Tool T 109-59.

Accelerator Pump Test

(1) Pour clean gasoline into the carburetor bowl (approximately ½ inch deep). Remove the accelerator pump plunger from the jar of gasoline. Flex the leather several times, then slide into the pump cylinder.

(2) Install the accelerator pump discharge check needle in the discharge passage. Raise the pump plunger and press lightly on the plunger shaft to expel air from the pump passages. Using a small clean brass rod, hold the discharge check needle firmly on its seat. Again raise the plunger and press downward. No fuel should be emitted from either the intake or discharge passage.

(3) If fuel does emit from the intake passage, remove the intake check ball and reclean the passage. Fuel leakage at the discharge check needle indicates the presence of dirt or a damaged check needle. Clean again and then install a new check needle. Retest for leakage.

(4) If either the intake check assembly or discharge check needle leaks after above test and service

fix, attempt to reseat as follows:

Remove the intake check assembly from the throttle body. Install a new check assembly, then retest as described in Steps 1, 2 and 3.

Discharge Check Needle

(1) With the discharge check needle installed, insert a piece of drill rod down on the needle. Lightly tap the dril rod with a hammer to form a new seat. Remove and discard the old needle and install a new one. Retest as described previously. If the service fix does not correct the condition, a new carburetor will have to be installed.

(2) Install the accelerator pump discharge check needle, jet housing and gasket. Install housing and attaching screws. Tighten screws securely.

(3) Press down on the accelerator pump plunger shaft, and as the plunger is being depressed, a clear straight stream should emit from each jet. If the streams are not identical, (if either one is diverted or restricted) a new accelerator pump jet housing should be installed. After test, pour the gasoline from the carburetor bowl and remove the pump plunger.

Assembling the Air Horn

(1) Slide the fuel inlet screen into the fuel line fitting, then install fitting in the air horn. Tighten securely.

(2) Test to see if the leather on the accelerator pump plunger is hard, cracked or worn. If any sign of wear or deterioration is evident, install a new plunger assembly.

(3) When reassembling, make sure the large diameter of the pivot screw enters the hole in the pump arm and that the shoulder on the screw has not pinched the pump arm.

(4) Place a new air horn to main body gasket in position on the air horn, then install the float needle valve seats. (Be sure each needle seat and needle is reinstalled in its original position).

The carburetors are equipped with synthetic rubber tipped fuel inlet needles. The needle tip is a rubber material which is not affected by gasoline and is stable over a wide range of temperatures. The tip is flexible enough to make a good seal on the needle seat, and to give increased resistance to flooding.

The use of the new inlet needles requires that care be used when making float adjustments. Avoid applying any pressure on the floats which might compress the tip of the fuel inlet needles.

NOTE: The tip can be compressed sufficiently to cause a false setting which will affect correct level of fuel in the bowl.

(5) Slide the right and left floats into position in the air horn, then install the float fulcrum pins.

NOTE: (Be sure the marked float is installed on the pump side of the air horn). See disassembly procedures.

(6) After the floats have been installed, measure the float alignment, level and drop settings as follows:

Float Alignment Setting

(1) Sight down the side of each float shell to determine if the side of the float is parallel to the outer edge of the air horn casting, as shown in Fig. 9.

(2) If the sides of the float are not in alignment with the edge of casting, bend the float lever by applying pressure to the end of the float shell with the fingers while supporting the float lever with the thumb.

NOTE: To avoid damage to the float, apply only enough pressure to bend the float lever.

(3) After aligning the floats, remove as much clearance as possible between the arms of the float lever and the lugs on the air horn. To do this, bend the float lever. The arms of the float lever should be parallel as possible to the inner surfaces of the lugs or the casting.

Float Level Setting

(1) With the air horn inverted, the air horn gasket in place and the float needle seated, slide the float gauge (refer to specifications for carburetor being worked on) between the top of the float (at outer end) and the air horn gasket, as shown in Figure 10. Float should just touch the gauge.

(2) Test the other float in the same manner. If an adjustment is necessary, bend the float arm

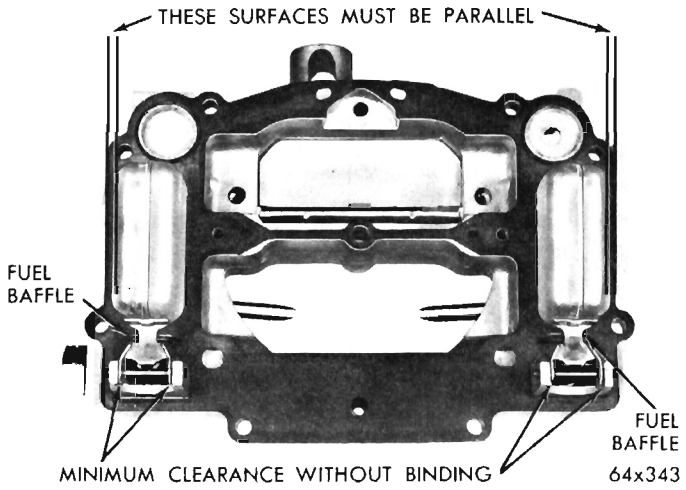


Fig. 9—Testing Float Alignment

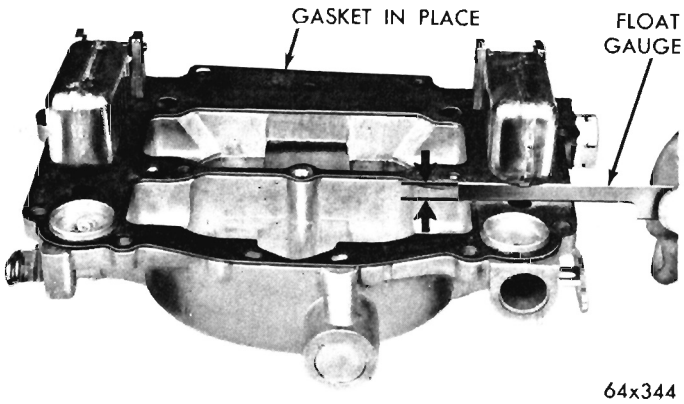


Fig. 10—Measuring Float Height

using Tool T109-22, until the correct clearance has been obtained. After bending the arm, retest the float alignment.

Float Drop Setting

(1) Holding the air horn in an upright position, measure the distance from the top of the floats (outer end) to the air horn gasket, as shown in Figure 11. This measurement should be ¾ inch. If an adjustment is necessary, bend the stop tabs on the float levers until the correct drop setting has been obtained. Bend the tab toward the needle seat to lessen the drop, or away from the seat to increase the drop.

(2) After the floats have been tested and adjusted, continue to assemble the carburetor as follows:

(3) Place the accelerator pump plunger lower spring in the pump cylinder, then lower the air horn carefully down on the main body. Care must be taken to center the small brass main bleed tubes so that they will pass through the holes in the air horn without being damaged.

NOTE: Be sure the fuel baffles on the air horn, slide down in front, (bowl side) of the float chamber baffles, or the air horn will not index correctly with the main body and can cause the floats to hang up. Be sure the leather on the plunger does not curl or wrinkle. Accelerator pump operation will be affected if this precaution is not observed.

(4) Install the 10 air horn attaching screws and tighten securely. (The two long screws should be installed in the holes that are located at the air cleaner mounting surface. The 1 inch screw at the front and the 1½ inch at the rear).

The change from the low speed, best fuel economy, road load mixtures to the richer wide open throttle full power mixtures is now accomplished in two steps. This has made it possible to secure best low speed fuel economy without sacrificing performance in the intermediate speed range. To do this, there is a new step-up piston and spring assembly, new metering rods with three diameters, and new style primary metering jets, as shown in Figure 12.

(5) Slide the step-up piston spring into the piston cylinders, followed by the step-up pistons and step-up rods. Install the cover plates and attaching screws while holding the step-up pistons down in position. Tighten screws securely.

(6) Test the fit of the choke valve in the air horn. The valve should be evenly spaced on all sides. Loosen screws and reposition if necessary.

(7) Engage the throttle connector rod with the primary throttle shaft lever, then install the hairpin clip. Install the clevis clip to the rod and pump arm.

(8) Engage the lower end of the fast idle connector rod with the fast idle cam, then swing in an arc to lock in cam. Slide the other end of the rod into the choke shaft lever and secure with the hairpin clip.

Installing the Vacuum Diaphragm

(1) Install the vacuum diaphragm assembly on the

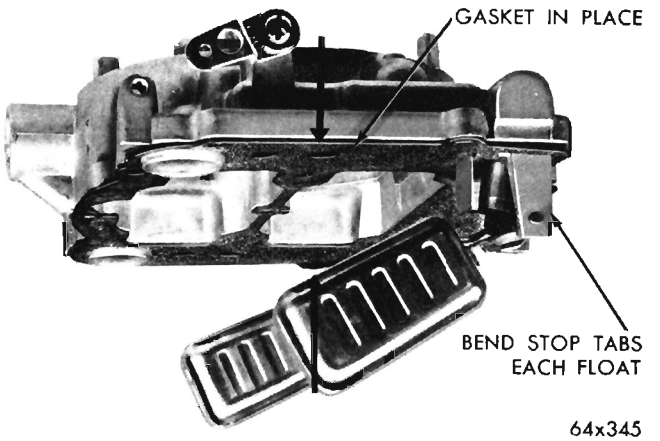


Fig. 11—Measuring Float Drop

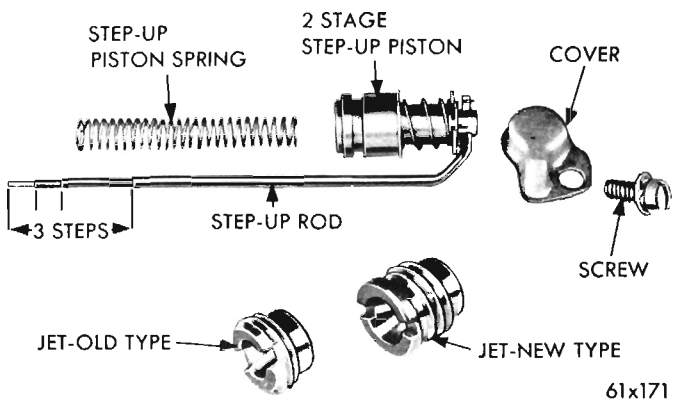


Fig. 12—Step Up Piston, Rod and Jet

air horn and tighten the attaching screws securely.

(2) Install the choke operating link in position between the diaphragm plunger (stem) and the choke lever. Install the hairpin clip to secure.

(3) Inspect the vacuum diaphragm fitting and remove any dirt or foreign material which could clog the passage. Inspect the rubber hose for cracks, before placing it on the correct throttle body fitting. (Refer to Fig. 1).

Do not connect the vacuum hose to the diaphragm fitting until after the vacuum kick adjustment has been made. (See Carburetor Adjustments.)

4. CARBURETOR ADJUSTMENTS

The following adjustments should be made with the carburetor on the bench for ease of working, and, should be made in the following order:

Fast Idle Speed and Cam Position Adjustment

The fast idle engine speed adjustment should be made on the vehicle, as described in the Paragraph "Fast Idle Speed Adjustment". However, the Fast Idle Cam Position Adjustment can be made on the bench.

(1) Open the throttle valves far enough to allow the fast idle speed adjusting screw to clear the fast idle cam.

(2) Insert a $^{13}/_{64}$ inch drill or gauge between the choke valve and the air horn wall, as shown in Figure 13.

(3) Close the throttle valves until the fast idle speed adjusting screw contacts the fast idle cam.

(4) Adjust the fast idle connector rod, using Tool T109-213 by bending at the angle, until the fast idle speed adjusting screw lightly contacts the **middle step**

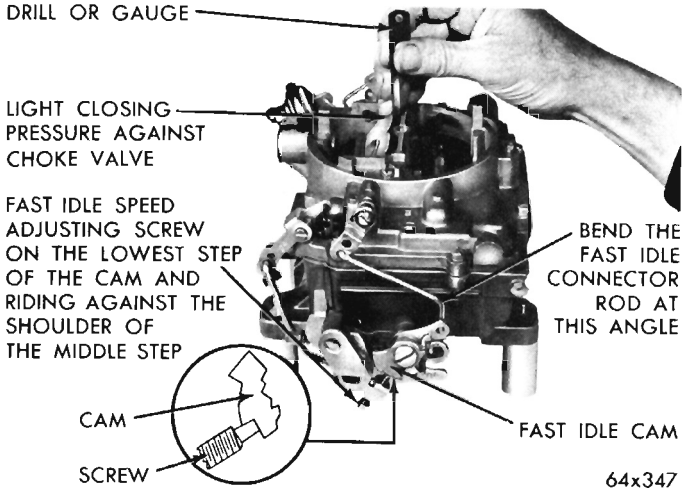


Fig. 13—Fast Idle Cam Position Adjustment

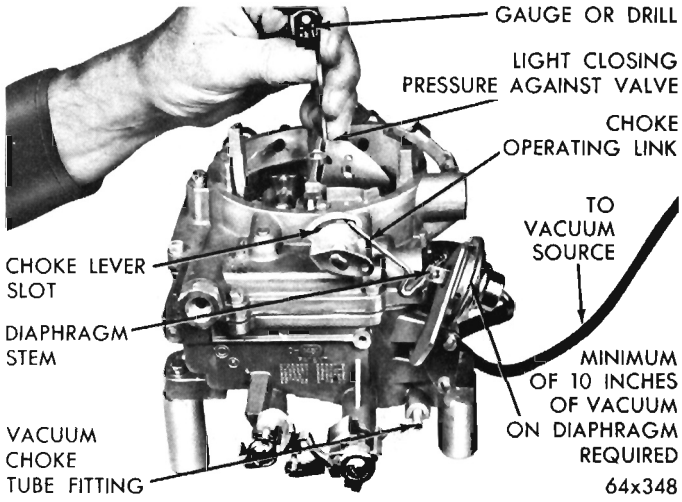


Fig. 14—Testing the Vacuum Kick Setting

on the fast idle cam, but slides onto the **bottom step** of the cam. The fast idle speed adjusting screw must touch or ride against the shoulder of the **middle step** on the cam.

(This special procedure is required, because the fast idle speed cam is spring loaded to follow the choke valve).

Vacuum Kick Adjustment—This test can be made **On** or **Off** the Vehicle).

To make the vacuum kick adjustment, the vacuum diaphragm must be energized (either a distributor testing machine with a vacuum source, or vacuum supplied by another vehicle).

(1) With the engine **Not** running, open the throttle valves far enough to allow the choke valve to be moved to the closed position.

(2) Disconnect the vacuum hose from the diaphragm and connect the hose from the vacuum supply, as shown in Figure 14. (A minimum of 10 inches of mercury (HG) will be required).

(3) Insert a ⅛ inch drill or gauge between the choke valve and the wall of the air horn. (Refer to Figure 14). Apply a slight closing pressure to the choke shaft to hold the drill or gauge in position.

(4) An adjustment will be necessary if a slight drag is not obtained as the drill or gauge is being removed.

The adjustment of this opening will require the removal of the choke operating link.

CAUTION: Damage to the diaphragm and the choke lever slot can result, if the link is not removed for the bending operation.

(5) Remove the hairpin clip and disengage the choke operating link from the diaphragm stem (plunger), then disengage the link from the choke lever.

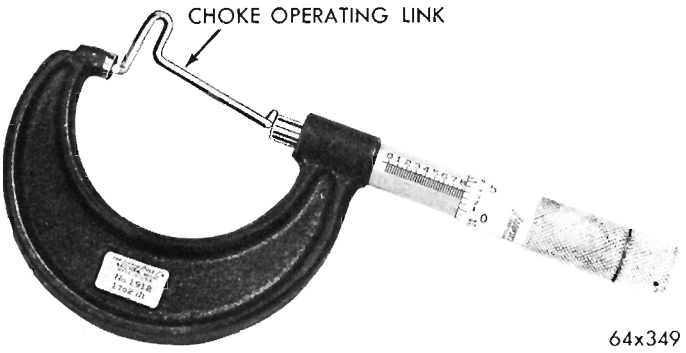


Fig. 15—Choke Operating Link Measurements

(The best bending results will be obtained by using a vise and a pair of pliers.)

(6) Bend the choke operating link at the angle to provide the correct choke valve opening.

CAUTION: A correction in the length of the link of .015 inch, will result in a change of .010 inch in the choke valve opening.

As an example, if the choke valve opening is .010 inch in error, the correction in the link length would be .015 inch.

A "2" inch micrometer will be helpful in establishing the original length of the link, as shown in Figure 15, before completing the adjustment.

(7) Install the choke operating link and retest the choke valve opening, using a drill or gauge. (Refer to Figure 14).

Reinstall the vacuum hose to the diaphragm and make the following check:

(8) With no vacuum applied to the diaphragm, some clearance should exist between the choke operating link and the choke lever slot, in both the open and closed choke valve positions, as shown in Figure 16.

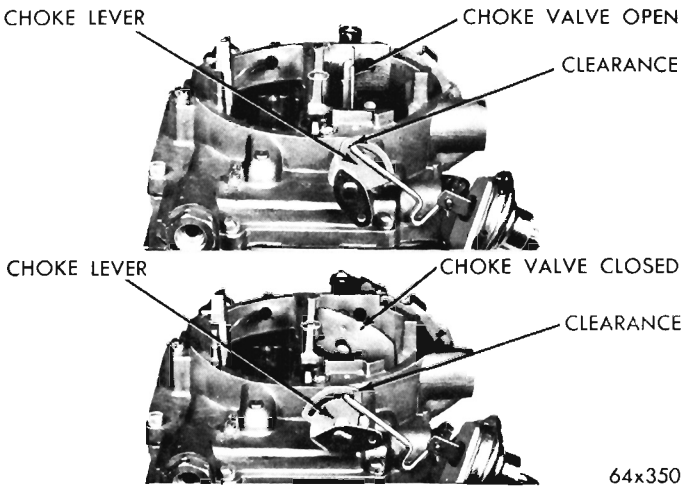


Fig. 16—Choke Operating Link Clearances

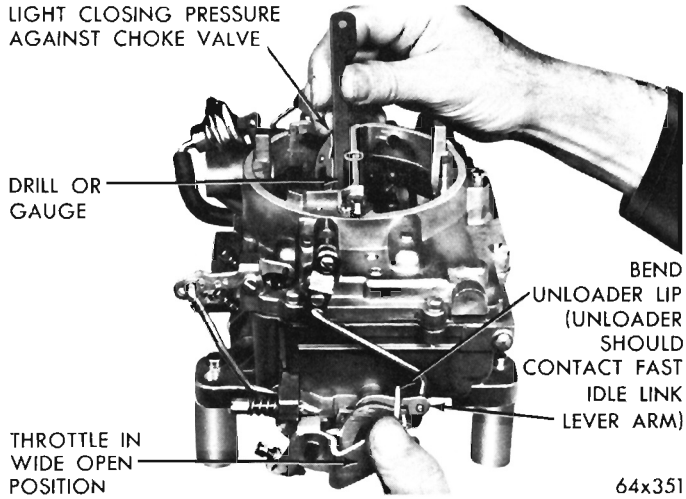


Fig. 17—Testing Choke Unloader (Wide Open Kick)

NOTE: This clearance is necessary to allow the choke valve to close for starting as well as fully open after the engine reaches the normal operating temperature.

If a clearance does not exist in both of these positions, a recheck of the operating link adjustment should be made.

NOTE: Free movement of the choke valve between the closed and open positions is very necessary.

This free movement should also exist between the kick and the open choke valve positions with the engine running. If binding does exist, the choke operating link has been improperly bent and should be corrected.

Choke Unloader Adjustment

With the throttle valves in the wide open position, it should be possible to insert Tool T109-80 (⅜ inch) gauge between the upper edge of the choke valve and the inner wall of the air horn, as shown in Figure 17.

If an adjustment is necessary, bend the unloader lip on the throttle shaft lever, using Tool T109-41, until the correct opening has been obtained.

Accelerator Pump Adjustment

(1) Move the choke valve to wide open position, to release the fast idle cam. Back off the idle speed adjusting screw (curb idle) until the throttle valves are seated in the bores.

(2) Measure the distance from the top of the air horn to the top of the plunger shaft, using a "T" scale, as shown in Figure 18. This distance should be $\frac{7}{16}$ inch.

(3) If an adjustment is necessary, bend the throttle connector rod at the lower angle, using Tool T109-213, until the correct travel has been obtained.

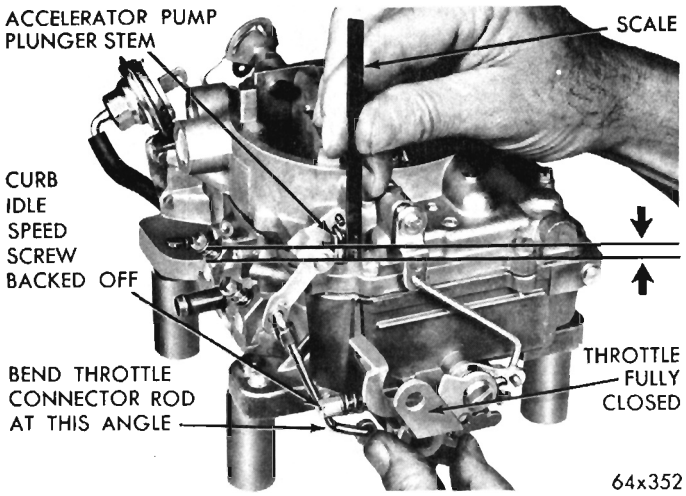


Fig. 18—Measuring Accelerator Pump Travel

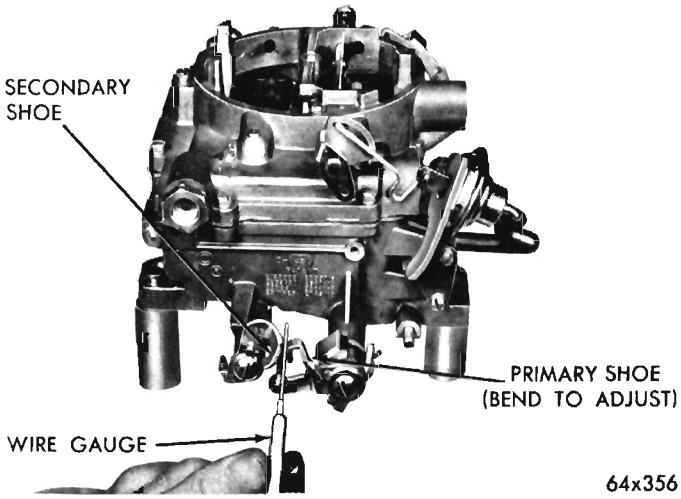


Fig. 20—Measuring Clearance Between Closing Shoes

Secondary Throttle Lever Adjustment

(1) To measure the secondary throttle lever adjustment, block the choke valve in the wide open position and invert the carburetor.

(2) Slowly open the primary throttle valves until it is possible to measure $2\frac{1}{64}$ inch between the lower edge of the primary valve and the bore (opposite idle port) as shown in Figure 19. At this measurement, the secondary valves should just start to open.

(3) If an adjustment is necessary, bend the secondary throttle operating rod at the angle, using Tool T-109-213, until the correct adjustment has been obtained.

(4) With the primary and secondary throttle valves in the tightly closed position, it should be possible to insert Tool T109-20 (.020") wire gauge, between the positive closing shoes on the secondary throttle levers, as shown in Figure 20.

(5) If an adjustment is necessary, bend the shoe on the secondary throttle lever, using Tool T109-22, until the correct clearance has been obtained.

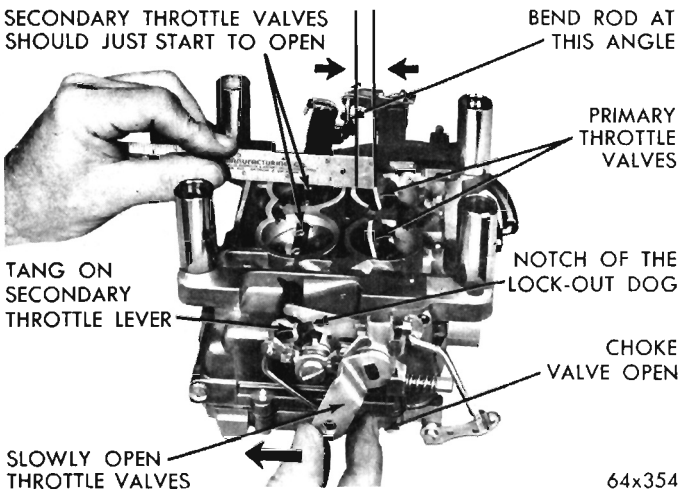


Fig. 19—Measuring Secondary Throttle Opening

Secondary Throttle Lock-Out Adjustment

(1) Crack the throttle valves, then manually open and close the choke valve. The tang on the secondary throttle lever should freely engage in the notch of the lockout dog. (Refer to Fig. 19).

(2) If an adjustment is necessary, bend the tang on the secondary throttle lever, until engagement has been made. Use Tool T109-22 for this operation.

(3) After adjustments have been made, reinstall carburetor on the engine, using a new gasket.

(4) It is suggested that the carburetor bowl be filled with clean gasoline. This will help prevent dirt that is trapped in the fuel system, from being dislodged by the free flow of fuel, as the carburetor is primed.

Idle Speed Adjustment—(Curb Idle)

To make the idle speed adjustment, the engine must be thoroughly warmed up. A much more reliable idle adjustment can usually be obtained if the vehicle has been driven a minimum of five miles. For the best results, it is recommended that a tachometer be used in this adjustment. (Before making the idle speed adjustment observe the following precautions:)

Because the alternator can charge at idle speeds and impose a load on the engine, the headlamps should be turned on high beam. This will assure setting the idle to compensate for the alternator load.

On vehicles equipped with the automatic transmission, refer to the "Throttle Linkage Adjustment Illustration" covering the AFB Carburetors (Fig. 4).

(1) To make the idle speed adjustment, turn the idle speed screw **in** or **out** to obtain 500 rpm. (With air conditioning **On**, set the idle speed at 500 rpm).

Be sure the choke valve is fully open and that the fast idle adjusting screw is not contacting the fast idle cam.

(2) Turn each idle mixture screw to obtain the highest rpm. While making the adjustment, carefully watch the tachometer and notice that the speed can be decreased by turning the screws in either direction from the setting that gave the highest rpm reading.

(3) Readjust to 500 rpm with the idle speed screw.

(4) Turn each idle mixture adjusting screw in the clockwise direction (leaner) until there is a slight drop in rpm. Turn each screw out, counter-clockwise (richer) just enough to regain the lost rpm.

This procedure will assure that the idle has been set to the leanest possible mixture for smooth idle. **This setting is very important!**

Since the correct speed was originally set using the speed screw, the speed obtained after finding the leanest smooth idle setting will probably be too fast.

(5) Readjust the speed screw to obtain correct idle speed. Repeat steps 2 and 4 above if necessary.

After the proper idle speed has been obtained, move the sliding link to the rear, against the stop, and tighten the nut securely.

Fast Idle Speed Adjustment (On the Vehicle)

To set the fast idle speed on the vehicle, connect a tachometer to the vehicle, then set the curb idle speed and proceed as follows:

(1) With the engine running and the transmission in the neutral position, open the throttle slightly.

(2) Close the choke valve about 20 degrees, then allow the throttle to close. Return the choke valve to the wide open position.

(3) The fast idle speed adjusting screw should be contacting the lowest step on the fast idle cam, as shown in Figure 21.

(4) With the engine warmed-up to the normal operating temperature, turn the fast idle speed adjusting screw **in** or **out** to secure 700 rpm. **Reposition the cam and throttle after each fast idle speed screw adjustment.**

5. AUTOMATIC CHOKE—WELL TYPE

To function properly, it is important that all parts be clean and move freely. Other than the occasional cleaning the automatic choke control requires no servicing. However, it is very important that the choke control unit works freely at the thermostatic coil spring housing and at the choke shaft. Move the choke rod up and down to test the free movement of the coil housing on the pivot. If unit binds, a new unit should be installed. The Well Type Choke Control Unit **is serviced only as a complete unit. Do not attempt to repair.**

When installing the well type choke unit, make certain that the coil housing does not contact the sides of the wall in the intake manifold. Any contact at this point will affect choke operation.

Do not lubricate any parts of the choke or control unit since this causes dirt accumulation which would result in binding of the choke mechanism.

Do not attempt to change the calibration setting. (Refer to specifications). This is predetermined and should it be changed, improper choke action would result.

Clean all choke parts using a suitable solvent and then blow dry with compressed air. Examine all choke parts for wear or damage. Worn or damaged parts must be replaced with new in order to insure proper choke operation.

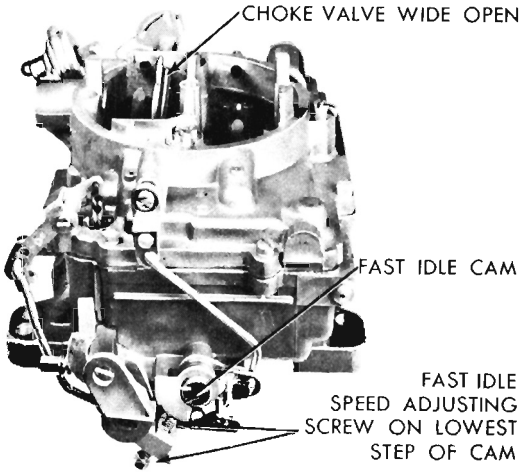


Fig. 21—Fast Idle Speed Adjustment (On the Car)

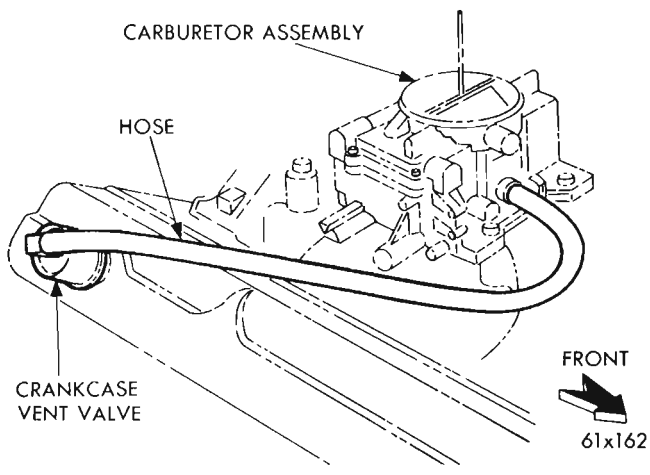


Fig. 22—Closed Crankcase Vent System

6. CLOSED CRANKCASE VENT SYSTEM

The closed crankcase ventilator valve is located in the crankcase vent tube cap and is connnected to the carburetor throttle body via a rubber tube. (See Fig. 22).

The function of the valve is to control the unburned fuels that originate in the crankcase. The gases are returned to the intake manifold, fed back into the combustion chambers and then expelled out through the exhaust system as completely burned products.

For servicing procedures of this system, refer to Group 9, "Engine".

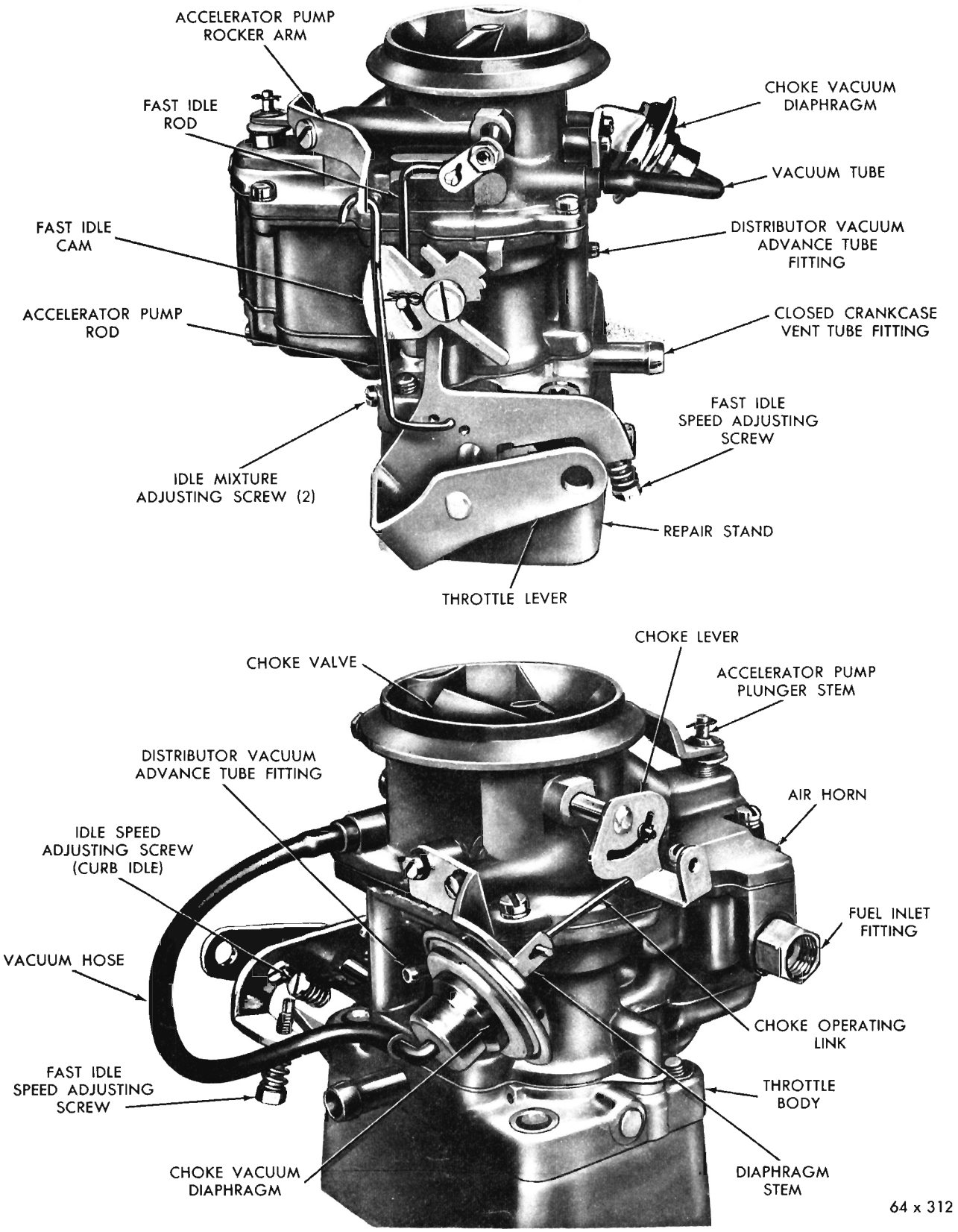


Fig. 1 —Carburetor Assembly (WW3-239 WW3-240)

PART 5

CARBURETOR (WW-3 STROMBERG)

There are two models of WW series carburetor, depending on the type of transmission with which the vehicle is equipped.

The same basic design applies to all models regardless of adaptions. Refer to Specifications for detailed information.

(1) **Model** WW3-239 is used when the vehicle is equipped with the standard 3 Speed Transmission only.

(2) **Model** WW3-240 is used when the vehicle is equipped with the Automatic Transmission.

Dirt, dust, water and gummy deposits are some of the main causes for poor carburetor operation. However, proper cleaning and installation of new parts, where required, will return the carburetor to its originally designed performance.

When overhauling the carburetor, several items of importance should be observed to assure a good job.

(1) All parts (except the choke diaphragm) should be carefully cleaned in a suitable solvent, then inspected for damage or wear.

(2) Use air pressure only, to clear the various orifices and channels.

(3) Replace questionable parts with **NEW** ones. When checking parts removed from the carburetor, it is at times rather difficult to be sure they are satisfactory for further service. It is therefore recommended that in such case, **NEW** parts be installed.

SERVICE PROCEDURES

1. CARBURETOR

Disassembly (Fig. 1)

(1) Place the carburetor assembly on the repair block Tool C-3225. (This Tool is used to protect the throttle valves from damage and to provide a suitable base for working.) Disconnect cross-over choke rod.

(2) Remove the cotter pin that holds the pump operating rod in the center hole of the throttle lever. Disengage the rod from the lever.

(3) Remove the clip that retains the fast idle rod, then disconnect the rod.

(4) Remove the vacuum hose between the carburetor air horn and the vacuum diaphragm.

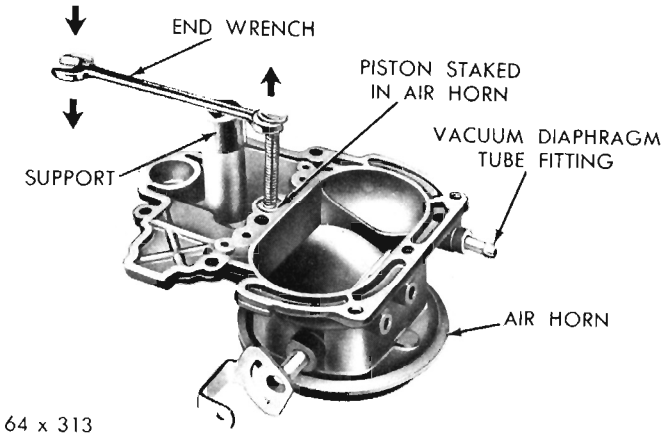


Fig. 2—Removing Vacuum Piston

(5) Remove the "E" clip from the choke operating link at the choke lever and disengage the link from the vacuum diaphragm stem. (Refer to Fig. 1).

(6) Remove the vacuum diaphragm and bracket assembly and place to one side to be cleaned as a separate item. **A liquid cleaner may damage the diaphragm material.**

(7) Remove the air horn attaching screws and remove the air horn.

(8) Disengage the accelerator pump plunger rod from the rocker arm by removing the clip; and the bowl vent valve. Slide the plunger and rod out of the air horn. Slide the spring seat and compression spring off the rod.

Place the accelerator pump plunger in a jar of clean gasoline or kerosene to prevent the leather from drying out.

(9) Remove the vacuum power piston from the air horn, using an open end wrench and a support, as shown in Figure 2. (Exert sufficient pressure on the end of the wrench to force the piston out of the air horn. This assembly is staked and care should be used at removal).

(10) Lift the idle tubes out of the main body, as shown in Figure 3. (The idle tubes are interchangeable).

(11) Remove the screw and gasket from the accelerator pump discharge cluster, then lift off the

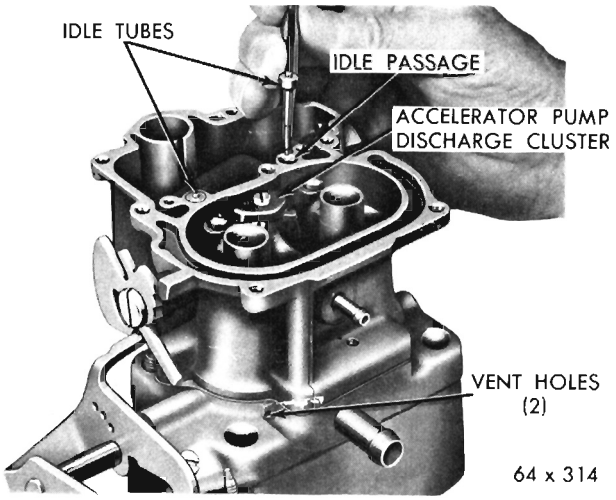


Fig. 3—Removing or Installing Idle Tubes

cluster and gasket, as shown in Figure 4.

(12) Invert the carburetor main body, and drop out the accelerator pump inlet and discharge check balls.

NOTE: Do not attempt to remove the high-speed bleeders located in the main discharge strut section of the carburetor main body. (See Fig. 5).

(13) Invert the carburetor main body and drop out the accelerator pump discharge check ball from the center of the discharge strut section. (See Fig. 11).

(14) Remove the fuel inlet needle valve seat and gasket assembly. Discard the gasket.

(15) Using a small screw driver, pry out the float fulcrum pin retaining spring. (Cup the hand over the float chamber to prevent the spring from flying out). Lift out the float and fulcrum pin.

(16) Remove the power by-pass jet and gasket, as shown in Figure 6.

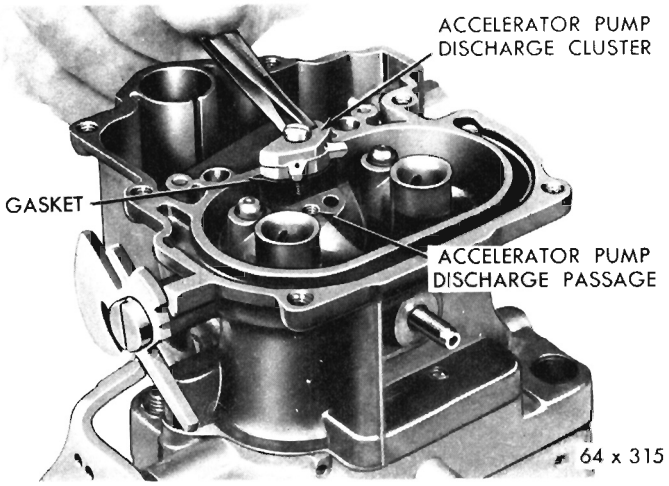


Fig. 4—Removing or Installing Discharge Cluster

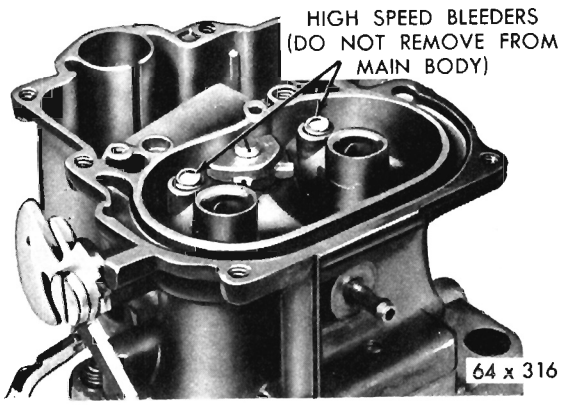


Fig. 5—High Speed Bleeders

(17) Remove the screws and lockwashers that hold the throttle body to the main body. Lift off the throttle body. Discard the gasket.

(18) With the main body in an inverted position, remove the main jet plugs, using Tool 73598 and 73609. Discard the plug gaskets.

(19) Using Tool 73606, remove the main metering jets, as shown in Figure 7. Do not substitute the main metering jets #388208 used in previous carburetors for #388539. (New type).

(20) Remove the main discharge jets (or tubes), using Tool 73608. This tool has tapered right hand thread and should be screwed into the jet. The threads that are formed in the jet during removal, will not damage the jet.

(21) Unscrew and remove the idle mixture adjusting screws and springs, from the throttle body.

The carburetor now has been disassembled into three units, namely, the air horn, main body and throttle body, and the component parts of each disassembled as far as necessary for cleaning and inspection.

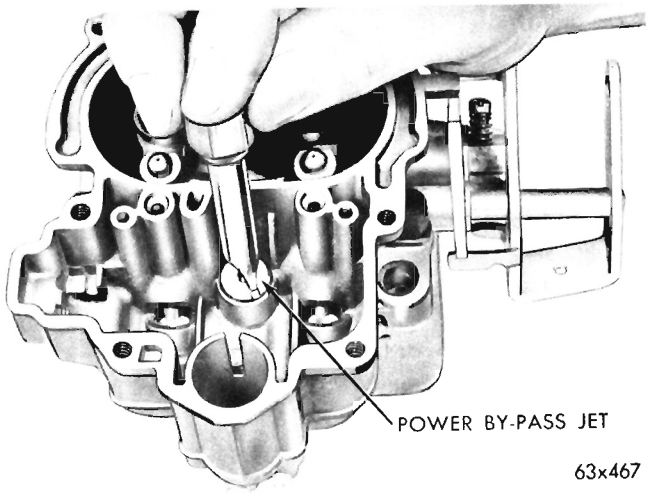


Fig. 6—Removing or Installing Power By-Pass Jet

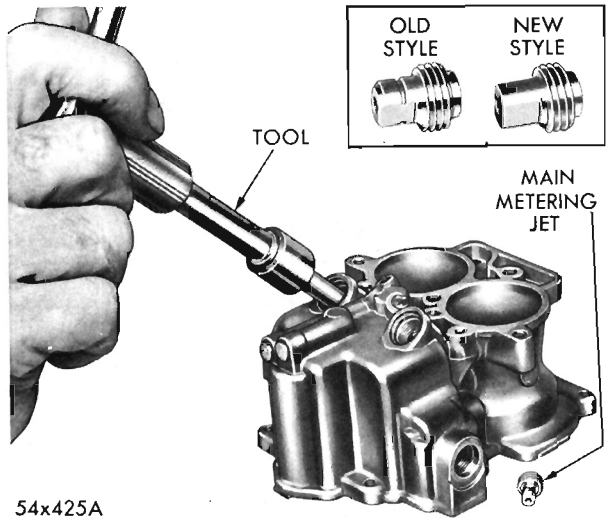


Fig. 7—Removing or Installing Main Metering Jets

NOTE: It is usually not advisable to remove the throttle shaft or valves unless wear or damage necessitates installation of new parts. To install new valves or throttle shaft, refer to "Inspection and Reassembly".

2. CLEANING THE CARBURETOR PARTS

The recommended solvent for gum deposits is denatured alcohol which is easily obtainable. However, there are other commercial solvents which may be used with satisfactory results.

The choke diaphragm can be damaged by solvents. Avoid placing the diaphragm assembly in **ANY** liquid. Clean the external surfaces with a clean cloth or a soft wire brush. Shake dirt or other foreign material from the stem side of the diaphragm. Depressing the diaphragm stem (plunger) to the retracted position, will provide an additional hole for the removal of dirt. Compressed air can be used to remove loose dirt **but should not be connected to the vacuum fitting of the diaphragm.**

IMPORTANT: If the commercial solvent or cleaner recommends the use of water as a rinse, it should be "HOT". After rinsing, all trace of water must be blown from the passages with air pressure. It is further advisable to rinse all parts in clean kerosene or gasoline to be certain no trace of moisture remains. Never clean jets with a wire, drill or other mechanical means because the orifices may become enlarged, making the mixture too rich for proper performance.

Inspection and Reassembly— Throttle Body

(1) Inspect the throttle shaft for excessive wear in the throttle body. If wear is extreme, it is recommended that the throttle body be replaced, rather than installing a new throttle shaft in the old body.

During manufacture, the location of the idle transfer port and spark advance control ports to the valves is carefully established for one particular assembly. (See Fig. 8).

If a new shaft should be installed in an old worn throttle body, it would be very unlikely that the original relationship of these ports to the valves would be obtained. Changing the port relationship would adversely affect normal car operation between the speeds of 15 and 30 miles per hour. However, if it has been determined that a new shaft is to be installed, adhere closely to the following instructions:

(2) Mark the valves to be sure each is replaced in the same bore from whence removed.

(3) Remove the screws that hold the throttle valves to the throttle shaft, then slide the valves out of the throttle shaft.

CAUTION: These screws are staked on the opposite side and care should be used at removal so as not to break the screws in the shaft.

(4) Slide the throttle shaft out of the throttle body.

(5) Install the new throttle shaft and lever in the throttle body. The fast idle lever should rest against the idle speed adjusting screw. **The idle speed adjusting screw must be backed out when seating the valves in the following operation.**

The "dash" stamped on the valves must be toward the idle port and visible from the top of the throttle body when the valves are installed.

(6) Slide the valves in position through the throttle shaft, then insert **NEW** screws, but do not tighten. Now hold the valves in place with the fingers. (Fingers

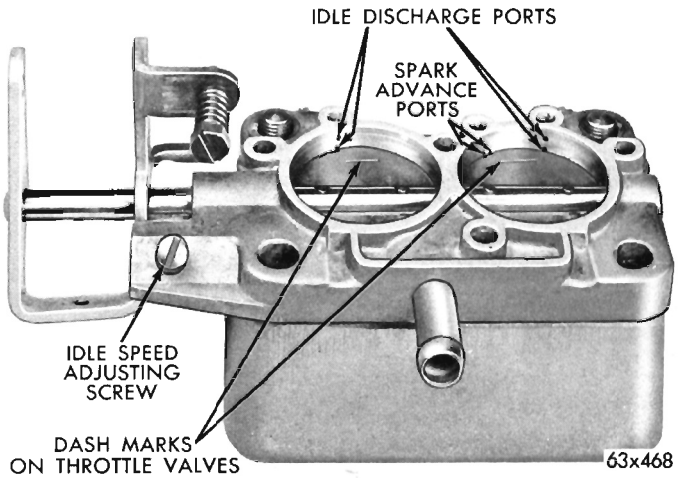


Fig. 8—Ports in Relation to Throttle Valves

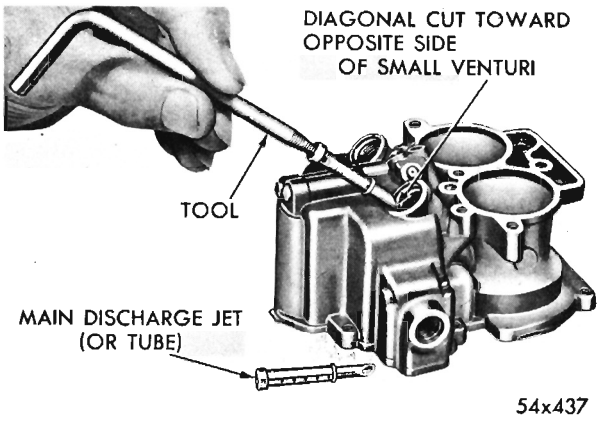


Fig. 9—Installing Main Discharge Jets (or Tubes)

pressing on the high side of the valves).

(7) Tap the valves lightly with a screw driver to seat in the throttle bores. Holding the valves in this position, tighten screws securely and stake by squeezing with pliers.

(8) Install the two idle mixture adjusting screws and springs in the throttle body. (The tapered portion must be straight and smooth). If the tapered portion is grooved or ridged, a new idle mixture adjusting screw should be installed to insure having the correct idle mixture control.

Idle Mixture Screw Adjustment

Do Not Use a Screw Driver. The adjustment should be made with the fingers. Turn the idle mixture adjusting screw **lightly** against its seat, then back off one full turn for approximate adjustment.

Reassembling the Carburetor Main Body

(1) Place the main discharge jets (or tubes) firmly on Tool 73608, as shown in Figure 9. Slide into position in the main body. Be sure the opening in the end of tube (diagonal cut end) is facing the opposite side of the small venturi. **These two jets must be seated firmly in the main body.**

(2) Insert the main metering jets in the body over the discharge jets (or tubes) just installed. Tighten securely, using Tool 73606. (See Fig. 7).

(3) Slide new copper gaskets in the main jet plug openings, then insert the plugs and tighten securely.

(4) Place the assembled throttle body on the inverted main body, using a new gasket. Install screws and lockwashers, then tighten securely.

(5) Invert the carburetor and place on repair block C-3225, then install the power by-pass jet and new gaskets.

The change from the lean road load mixture to the richer wide open throttle maximum power mixture is made with an intermediate step. This is accomplished with a spring loaded two position power jet, actuated by vacuum on the power jet piston. The purpose of this two stage action is to secure the best fuel economy in the lower road load speed range without sacrificing performance in the intermediate speed range.

During initial or part throttle operation, the vacuum above the piston is sufficient to overcome the compression spring and hold the piston in the up position. As the throttle valves are opened the manifold vacuum drops and the piston compression spring moves the piston down to open the first stage valve (upper) of the power by-pass jet, as shown in Figure 12. This meters additional fuel through the upper hole, into the main metering system.

With increased demand for power and a further drop in vacuum, the piston moves down an additional amount to open the second stage valve (lower) as shown in Figure 12, and meters an additional amount of fuel through the hole at the bottom of the power by-pass jet.

When the demand for power is satisfied and the throttle opening is decreased, the manifold vacuum builds up to raise the power piston and closes the 2nd stage valve (lower) cutting off the supply of fuel through the bottom hole of the jet. A further reduction of power closes the 1st stage valve (upper) cutting off the supply of fuel through the upper hole.

No changes in service procedures are required except to be sure the power by-pass jet is clean.

(6) Install the accelerator pump inlet check ball ($\frac{3}{16}$ inch diameter) in the check ball seat at the bottom of the pump cylinder, as shown in Figure 10.

(7) Install the accelerator pump discharge check ball ($\frac{1}{8}$ inch diameter) in the orifice in the center passage of the discharge strut section of the main body, as shown in Figure 11.

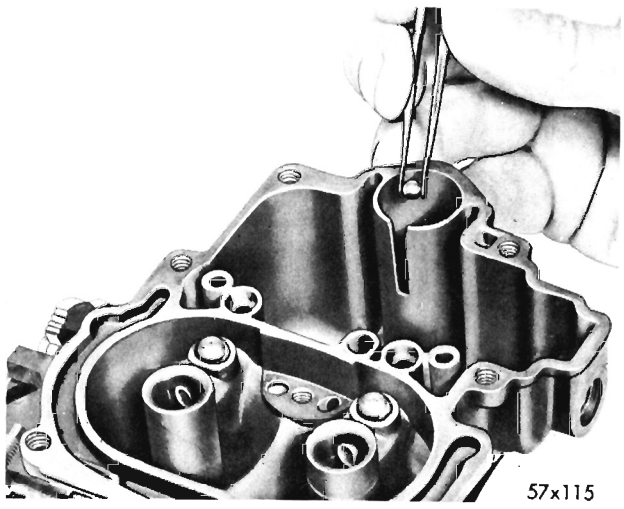


Fig. 10—Installing Accelerator Pump Check Ball

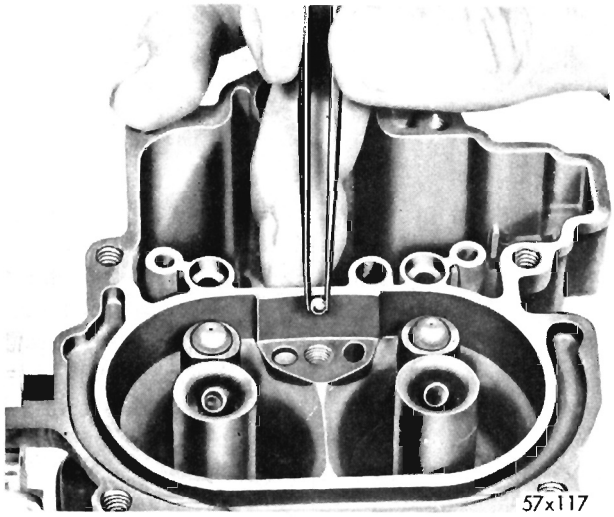


Fig. 11—Installing Discharge Check Ball

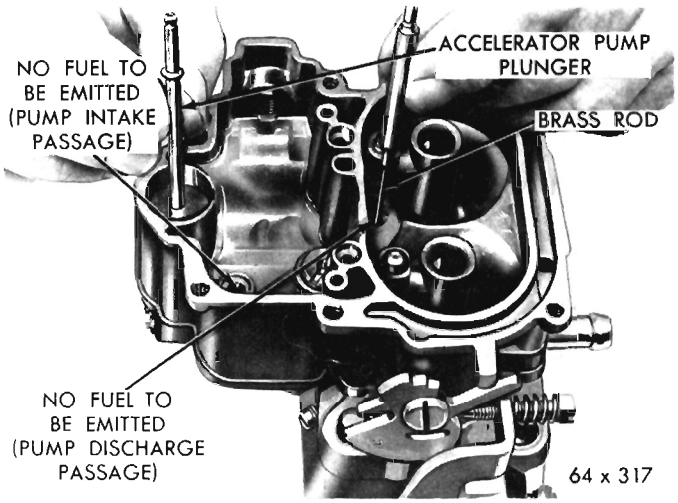


Fig. 13—Testing Accelerator Pump Intake and Discharge Check Balls

Accelerator Pump Test

(1) Pour clean gasoline into the carburetor bowl, approximately ½ inch deep. Remove the accelerator pump plunger from the jar of gasoline and slide down into the pump cylinder. Raise the plunger and press lightly on the plunger shaft to expel the air from the pump passage.

(2) Using a small clean brass rod, hold the discharge check ball firmly down on its seat. Again raise the plunger and press downward. No fuel should be emitted from either the intake or discharge passage, as shown in Figure 13.

(3) If any fuel does emit from either the intake or discharge passages, it indicates the presence of dirt or an imperfect check ball seat. The passage should be recleaned and then thoroughly blown out with compressed air. Examine the check ball seat for signs of damage that would not allow the ball to seat properly.

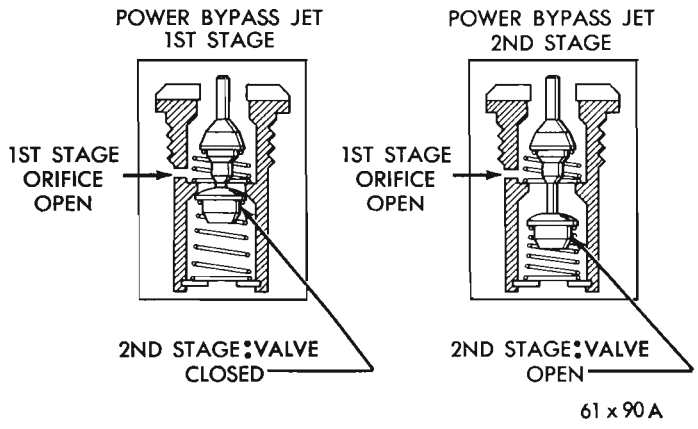


Fig. 12—Power By-Pass Jet (1st and 2nd Stage Operation)

(4) Reinstall check ball and test again. If still leaking, place a piece of drill rod down on ball and rap sharply with a hammer. Remove old check ball and install new ball. Then retest. (This operation forms a new ball seat in the carburetor casting).

(5) Install the discharge cluster gasket, cluster and screw. Tighten securely. (See Fig. 4).

Again depress the accelerator pump plunger. A clear straight stream should emit from each cluster jet. If the streams are not identical (if either one is diverted or restricted), a new discharge cluster should be installed.

After test, pour the gasoline from the carburetor bowl and remove the accelerator pump plunger.

(6) Test the float for leaks or damage. If satisfactory for further service, install in position in the carburetor bowl.

(7) Assemble the fuel inlet needle valve, seat and gasket, then insert in position in the main body. Tighten securely. (If the needle is ridged or badly worn, install a new needle valve and seat assembly).

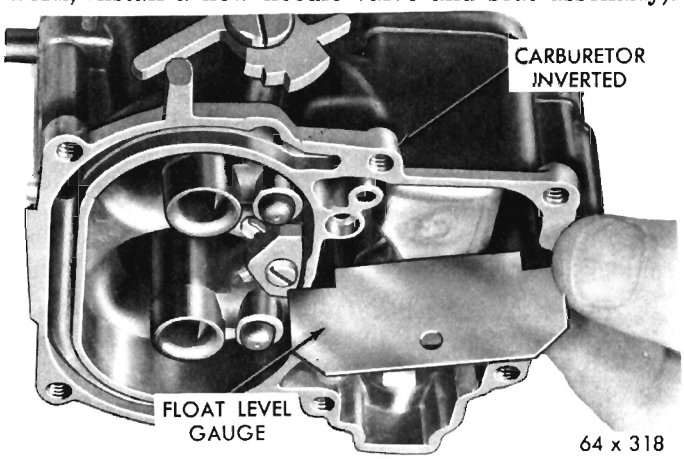


Fig. 14—Measuring the Float Setting

(8) Install the float fulcrum pin retaining spring in position and force under the lip of the boss to keep the fulcrum pin in position.

Measuring the Float Height

The carburetors are equipped with a syntehtic rubber tipped fuel inlet needle. The needle tip is a rubber material which is not affected by gasoline and is stable over a wide range of temperatures. The tip is flexible enough to make a good seal on the needle seat, and to give increased resistance to flooding.

The use of the new inlet needle requires care to perform the float setting operation accurately in order to secure the best performance and fuel economy.

(1) To correctly set the float height when the carburetor is being overhauled, install the float with the fulcrum pin and retaining spring in the main body.

(2) Install the needle, seat and gasket in the body and tighten securely.

(3) Invert the main body so that the weight of the float **only** is forcing the needle against the seat.

(4) Using Tool 73725 or a "T" scale measure the float, as shown in Figure 14. There should be 7/32 inch from the surface of the fuel bowl (gasket removed) to the top of the float at the center.

If an adjustment is necessary, hold the float on the bottom of the bowl, then bend the float lip toward or away from the needle, using Tool 73605. Retest the 7/32 inch setting again then repeat the lip bending operation as required.

CAUTION: When bending the float lip, do not allow the lip to push against the needle as the synthetic rubber tip can be compressed sufficiently to cause a false setting which will affect correct level of fuel in the bowl. After being compressed, the tip is very slow to recover its original shape.

NOTE: It is very important that the float lip be perpendicular to the needle or slanted not more than 10 degrees away from the needle when the float is set correctly. Do not bend float lip by forcing float. Use Tool 73605, as shown in Figure 15.

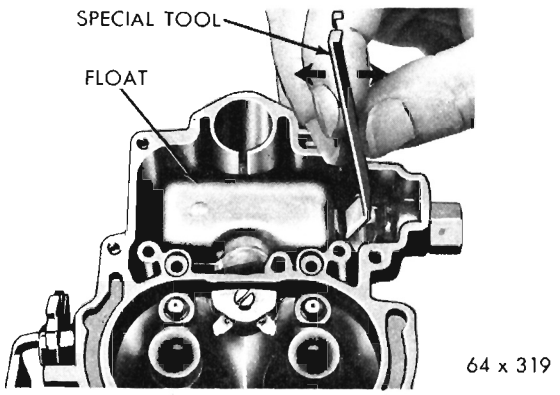


Fig. 15—Bending the Float Lip

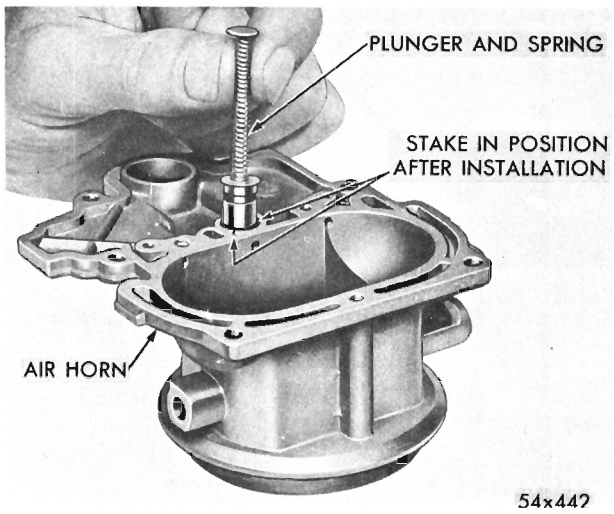


Fig. 16—Installing Vacuum Power Piston

(5) To change the float setting, bend the float lip toward the needle to lower, and away from the needle to raise the float. Install the idle tubes in the main body. (See Fig. 3.) **These tubes are interchangeable.**

Assembling the Air Horn (Fig. 1)

(1) Remove the accelerator pump plunger from the jar of gasoline. If the leather is hard, cracked or worn, install a new plunger and shaft.

(2) Slide the compression spring over the plunger shaft, followed by the bowl vent valve seat. Insert the assembly through the air horn.

(3) Install the vacuum power piston and plunger in the air horn, as shown in Figure 16. Lock in position by prick punching on the retaining rim. Compress the piston plunger to be sure no binding exists. If the piston sticks or binds enough to hinder smooth operation, install a new piston assembly.

(4) Slide the bowl vent valve over the shaft and down against the seat. Engage the pump shaft with the pump arm and secure with the clip.

(5) Slide a new air horn gasket over the accelerator pump plunger, and down against the air horn. Lower the air horn straight down on the main body, with the accelerator pump plunger sliding into its well. (Be sure the leather on the pump does not curl or fold back). Install the air horn retaining screws and lockwashers, then tighten securely.

(6) Install the accelerator pump and choke connector rods, then work the accelerator pump plunger several times, to be sure it operates freely.

Installing the Vacuum Diaphragm

(1) Install the diaphragm assembly on the air horn and tighten the attaching screws securely.

(2) Install the choke operating link in position between the diaphragm plunger (stem) and the choke lever. Install the "E" clip to secure.

(3) Inspect the vacuum diaphragm fitting and remove any dirt or foreign material which could plug the passage. Inspect the rubber hose for cracks, before placing it on the correct fitting. (Refer to Fig. 1).

Do not connect the vacuum hose to the diaphragm fitting until after the vacuum kick adjustment has been made. (See Carburetor Adjustments).

3. CARBURETOR ADJUSTMENTS

It is very important that the following adjustments be made on a reconditioned carburetor and in the sequence listed namely,

Fast Idle Speed and Cam Position Adjustment
Vacuum Kick Adjustment
Unloader Adjustment (wide open kick)
Accelerator Pump Travel Adjustment
Fast Idle Speed and Cam Position Adjustment

Fast Idle Speed and Cam Position Adjustment

The fast idle engine speed adjustment should be made on the car, as described in the Paragraph "Fast Idle Speed Adjustment". However, the Fast Idle Cam Position Adjustment can be made on the bench.

(1) With the fast idle speed adjusting screw contacting the lowest step on the fast idle cam, as shown in Figure 17, move the choke valve toward the closed position with light pressure. Insert a $\frac{5}{16}$ inch drill or gauge (manual transmission) or a $\frac{17}{64}$ inch drill or

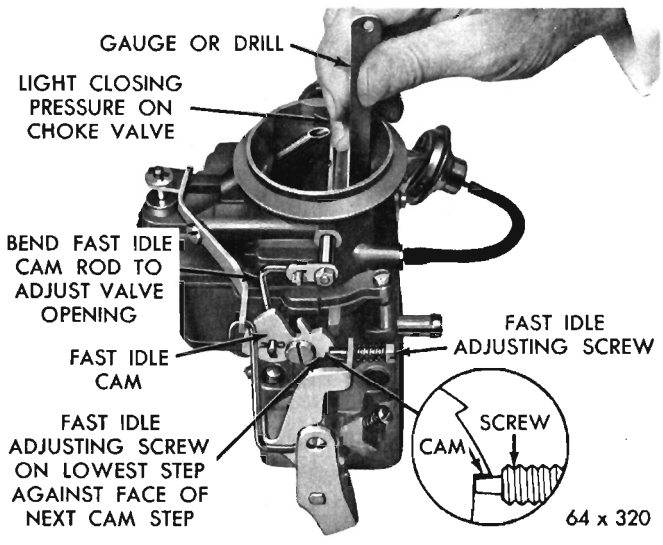


Fig. 17—Fast Idle Cam Position Adjustment

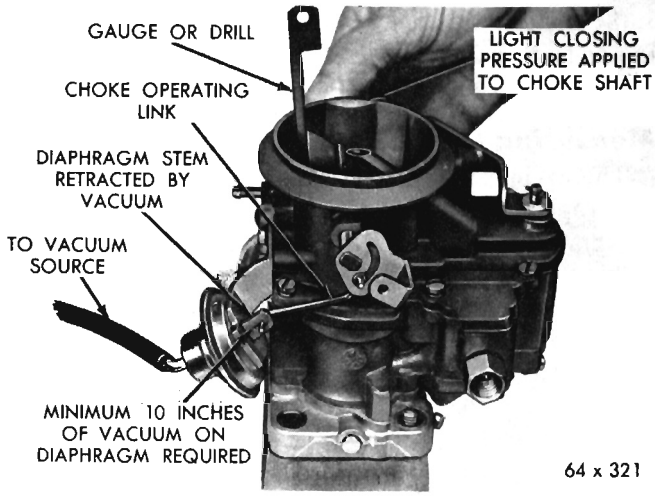


Fig. 18—Testing the Choke Vacuum Kick Setting

gauge (Automatic Transmission) between the choke valve and the wall of the air horn.

(2) An adjustment will be necessary if a slight drag is not obtained as the drill or gauge is being removed.

(3) If an adjustment is necessary, bend the fast idle rod at the upper angle, using Tool T109-213, until the correct valve opening has been obtained. (Refer to Fig. 17).

Vacuum Kick Adjustment—(This test can be made **On** or **Off** the vehicle).

To make the vacuum kick adjustment, the vacuum diaphragm must be energized (either a distributor testing machine with a vacuum source, or vacuum supplied by another vehicle).

(1) With the engine **Not** running, open the throttle valves far enough to allow the choke valve to be moved to the closed position.

(2) Disconnect the vacuum hose from the diaphragm and connect the hose from the vacuum supply, as shown in Figure 18. (A minimum of 10 inches of mercury (HG) will be required.)

(3) Insert a $\frac{15}{64}$ inch (manual transmission) or $\frac{13}{64}$ inch (Automatic Transmission) size drill or gauge between the choke valve and the wall of the air horn. (Refer to Fig. 18). Apply a slight closing pressure to the choke shaft.

(4) An adjustment will be necessary if a slight drag is not obtained as the drill or gauge is being removed.

The adjustment of this opening will require the removal of the choke operating link.

CAUTION: Damage to the diaphragm and the choke lever slot can result if the link is not removed for the bending operation.

(5) Remove the clip and disengage the choke

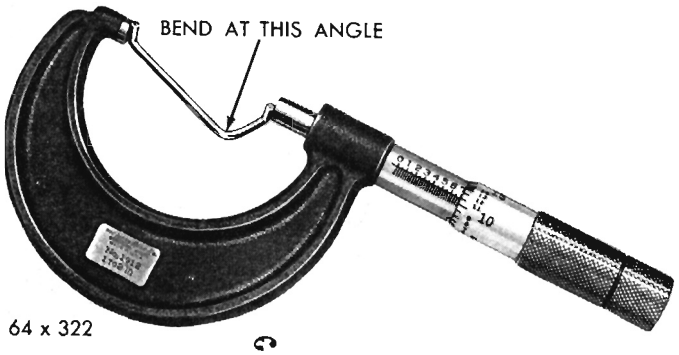


Fig. 19—Choke Operating Link Measurement

operating link from the choke lever, then disengage the link from the diaphragm stem. (The best bending results will be obtained by using a vise and a pair of pliers).

(6) Bend the choke operating link at the angle to provide the correct choke valve opening.

CAUTION: A correction in the length of the link of .010 inch, will result in a change of .015 inch in the choke valve opening.

As an example, if the choke valve opening is .015 inch in error, the correction in the link length would be .010 inch.

A "2" inch micrometer will be helpful in establishing the original length of the link, as shown in Figure 19, before completing the adjustment.

(7) Install the choke operating link and recheck the choke valve opening, using a gauge or drill. (Refer to Fig. 18).

(8) Reinstall the vacuum hose to the diaphragm and with no vacuum applied to the diaphragm, some clearance should exist between the choke operating link and the choke lever slot, in both the open and closed choke valve positions, as shown in Figure 20.

NOTE: This clearance is necessary to allow the choke valve to close for starting as well as fully open after the engine reaches the normal operating temperature.

If a clearance does not exist in both of these positions, a recheck of the operating link adjustment should be made.

NOTE: Free movement of the choke valve between the closed and open positions is very necessary.

This free movement should also exist between the kick and the open choke valve positions with the engine running. If binding does exist, the choke operating link has been improperly bent and should be corrected.

Unloader Adjustment (Wide Open Kick)

(1) To make the unloader adjustment, lightly hold the choke valve closed, then open the throttle valves to wide open position. The choke valve should open sufficiently to allow a No. 1 or 15/64" drill to be inserted between the choke valve and wall of air horn, as shown in Figure 21.

(2) To adjust, bend the tang on the throttle lever using Tool T109-214, as shown in Figure 21.

(3) Hold the choke open and then open and close the throttle valves. Failure to obtain full throttle operation indicates improper assembly or an adjustment of the choke mechanism is required.

(4) With the throttle valves held in the open position, open the choke valve slowly to wide open posi-

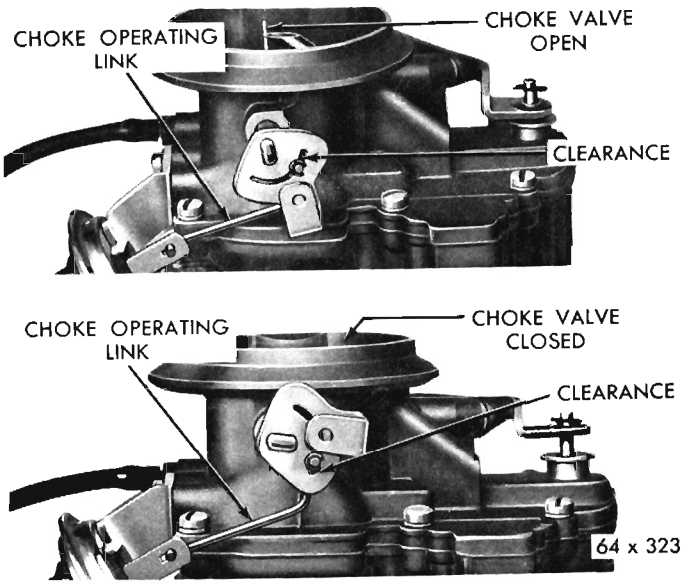


Fig. 20—Choke Operating Link Clearances

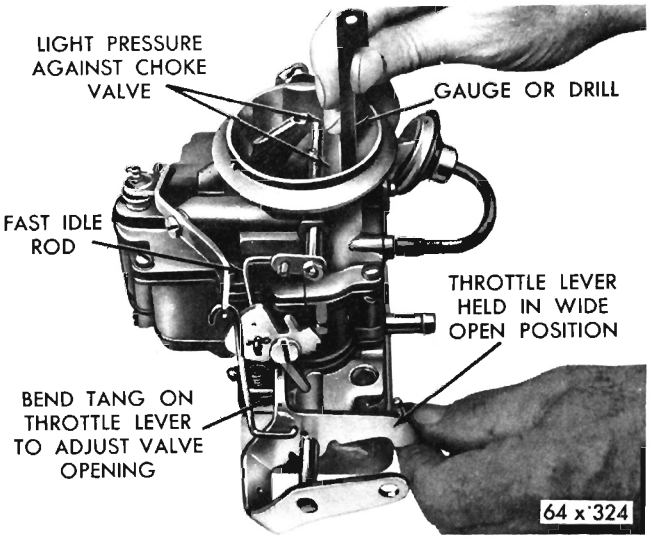


Fig. 21—Unloader Adjustment (Wide Open Kick)

tion. There should be no bind throughout the entire travel of choke mechanism.

Accelerator Pump and Bowl Vent Adjustment

When assembling the accelerator pump to the air horn, note that the horseshoe clip (which opens the bowl vent) can be placed in any one of the three positioning notches. These notches correspond to the long, medium and short pump stroke holes in the throttle lever. Normally, the bowl vent clip on the pump stem will be at the middle notch and the pump rod in the medium stroke hole.

The proper procedure is to adjust the amount of bowl vent opening instead of measuring and setting the height of the pump plunger.

To test or set the adjustment, proceed as follows:

(1) Back off the idle speed adjusting screw. Open the choke valve, so that when the throttle valves are closed, the fast idle adjusting screw will not contact the fast idle cam.

(2) Be sure the pump rod is in the medium stroke hole in the throttle lever, and that the bowl vent clip on the pump stem is in the center notch.

(3) Close the throttle valves tightly. It should be just possible to insert a $\frac{5}{64}$ inch drill between the bowl vent and the vent seat protruding through the air horn, as shown in Figure 22.

If an adjustment is necessary, bend the pump rod, using Tool T109-213 at the lower angle, until the correct bowl vent opening has been obtained, as shown in Figure 23.

This is an important adjustment, since too much lift at the bowl vent will result in considerable loss in low speed fuel economy.

Remember that if the pump rod is moved to either the short or long stroke position, a corresponding change must be made in the location of the bowl vent clip, and the amount of the lift of the bowl vent retested and adjusted.

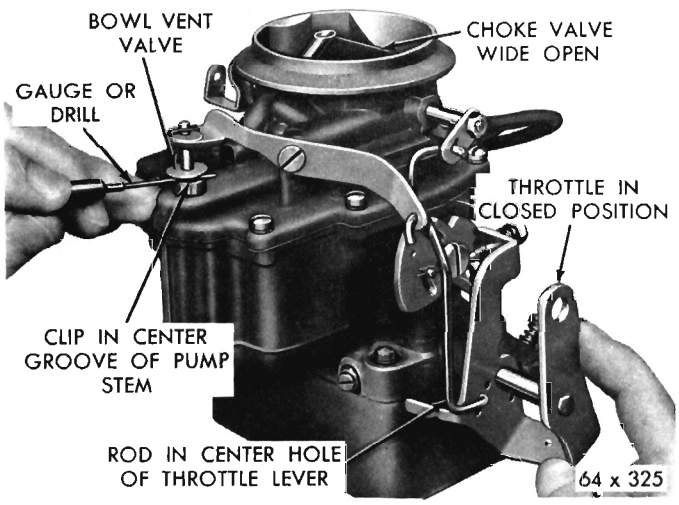


Fig. 22—Measuring the Bowl Vent Valve Opening

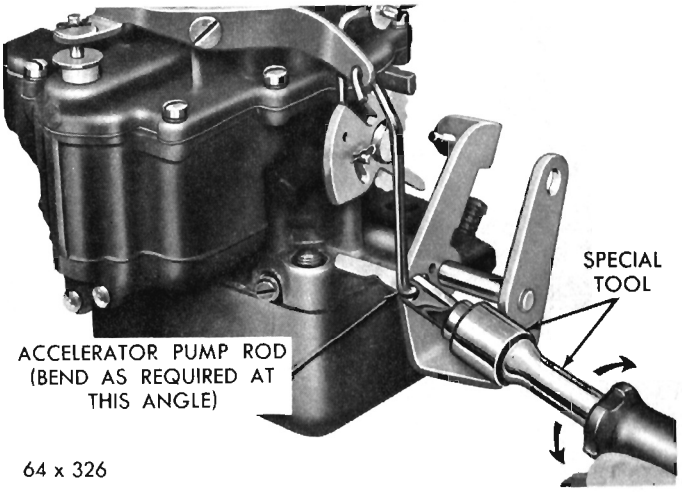


Fig. 23—Bending Accelerator Pump Rod

NOTE: The accelerator pump travel is automatically taken care of when the bowl vent is properly adjusted.

Idle Speed Adjustment (Curb Idle)

To make the idle speed adjustment, the engine must be thoroughly warmed up. A much more reliable idle adjustment can usually be obtained if the vehicle has been driven a minimum of five miles. For the best results, it is recommended that a tachometer be used in this adjustment. (Before making the idle speed adjustment, observe the following precautions:)

Because the alternator can charge at idle speeds and impose a load on the engine, the headlights should be turned on (high beam). This will assure setting the idle to compensate for the alternator vehicle load. On vehicles equipped with the automatic transmission, disconnect the transmission control rod from the ball joint on the carburetor lever so that the stop on the transmission will not interfere with the free movement of the carburetor lever.

To make the idle speed adjustment, proceed as follows:

(1) Turn the idle speed screw in or out to obtain 500 rpm. (With air conditioning **On,** set the idle speed at 500 rpm). Be sure the choke valve is fully open and the fast idle adjusting screw is not contacting the fast idle cam.

(2) Turn each idle mixture screw to obtain the highest rpm. While making the adjustment, carefully watch the tachometer and notice that the speed can be decreased by turning the screws in either direction from the setting that gave the highest rpm reading.

(3) Readjust to 500 rpm with the idle speed screw.

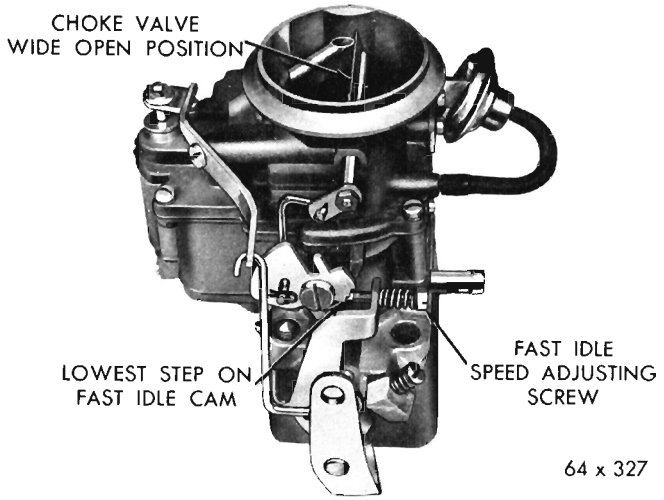


Fig. 24—Fast Idle Speed Adjustment (On the Car)

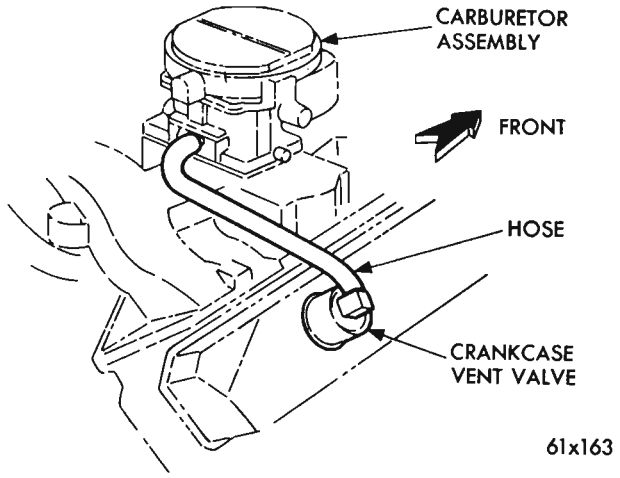


Fig. 25—Closed Crankcase Vent System

(4) Turn each idle mixture adjusting screw in the clockwise direction (leaner) until there is a slight drop in rpm. Turn each screw out, counter-clockwise (richer) just enough to regain the lost rpm.

This procedure will assure that the idle has been set to the leanest mixture possible for smooth idle. **This setting is very important.**

Since the correct speed was originally set using the speed screw, the speed obtained after finding the leanest smooth idle setting will probably be too fast.

(5) Readjust the speed screw to obtain correct idle speed. Repeat steps 2 and 4 above if necessary.

After the proper idle speed has been obtained, refer to Figure 3 of the "Throttle Linkage" on page 73 for the procedure on adjusting the transmission control rod.

Fast Idle Speed Adjustment (On the Vehicle)

To set the fast idle speed on the vehicle, connect a tachometer to the vehicle, then set the curb idle speed and proceed as follows:

(1) With the engine running and the transmission in the neutral position, open the throttle slightly.

(2) Close the choke valve about 20 degrees then allow the throttle to close. Return the choke valve to the open position.

(3) The fast idle speed adjusting screw should be contacting the lowest step on the fast idle cam, as shown in Figure 24.

(4) With the engine warmed-up to the normal operating temperature, turn the fast idle speed adjusting screw **in** or **out** to secure 700 rpm. **Reposition the cam and throttle after each screw adjustment.**

4. AUTOMATIC CHOKE—WELL TYPE

To function properly, it is important that all parts be clean and move freely. Other than the occasional cleaning, the automatic choke control requires no servicing. However, it is very important that the choke control unit works freely at the thermostatic coil spring housing and at the choke shaft. Move the choke rod up and down to check for free movement of the coil housing on the pivot. If the unit binds, a new unit should be installed.

The Well Type Choke Unit is serviced only as a complete unit. Do not attempt to repair.

When installing the well type choke, make certain that the coil housing does not contact the sides of the well. Any contact at this point will affect choke operation.

Do not lubricate any parts of the choke or control unit since this causes dirt accumulation which would result in binding of the choke mechanism.

Do not attempt to change the calibration setting. This is predetermined and should it be changed, improper choke action would result.

5. CLOSED CRANKCASE VENT SYSTEM

The closed crankcase ventilator valve is located in the crankcase vent tube cap and is connected to the carburetor throttle body via a rubber tube.

The function of the valve is to control the unburned fuels that originate in the crankcase. The gases are returned to the intake manifold, fed back into the combustion chambers and then expelled out through the exhaust system as completely burned products. (See Fig. 25).

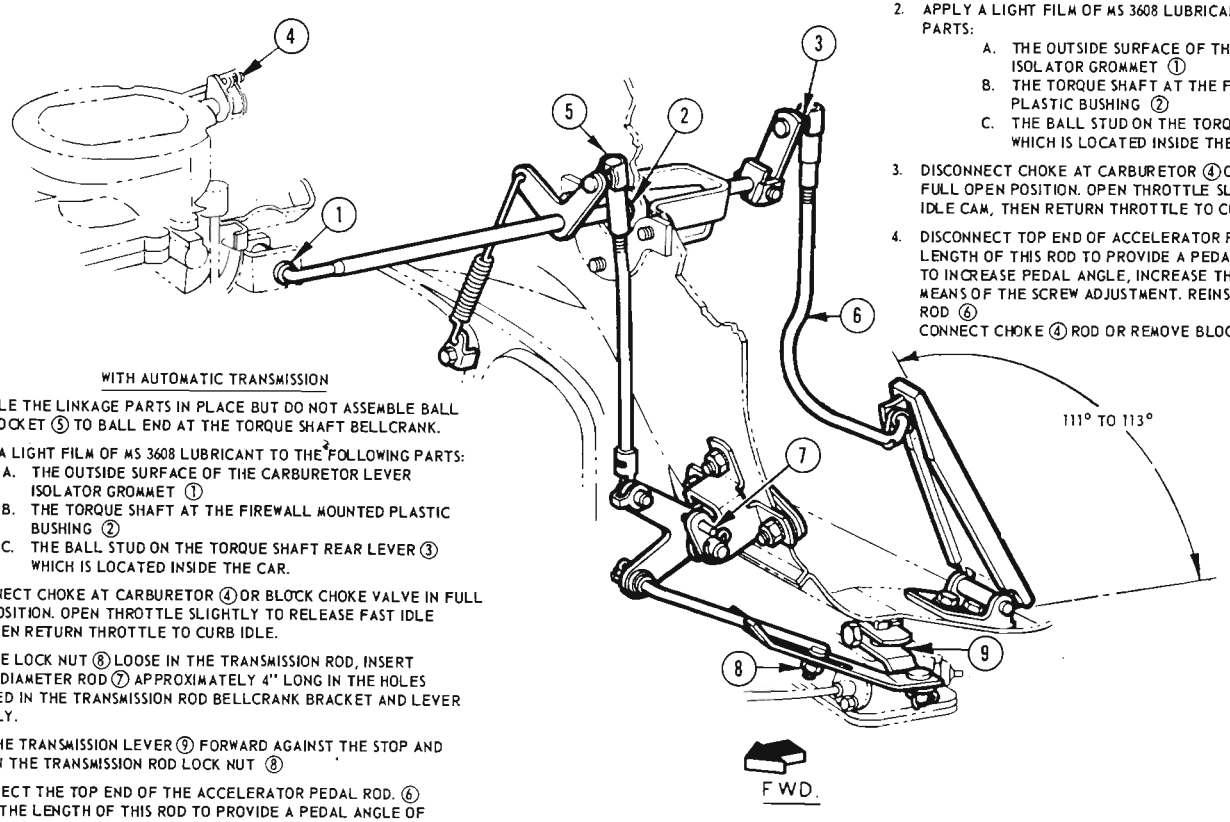
For servicing procedures of this valve, refer to Group 9, "Engine".

PART 6

THROTTLE LINKAGE

1. THROTTLE LINKAGE ADJUSTMENTS

Refer to Figures 1, 2, 3 and 4 for throttle linkage adjustment for all the cubic inch engines.



WITH AUTOMATIC TRANSMISSION

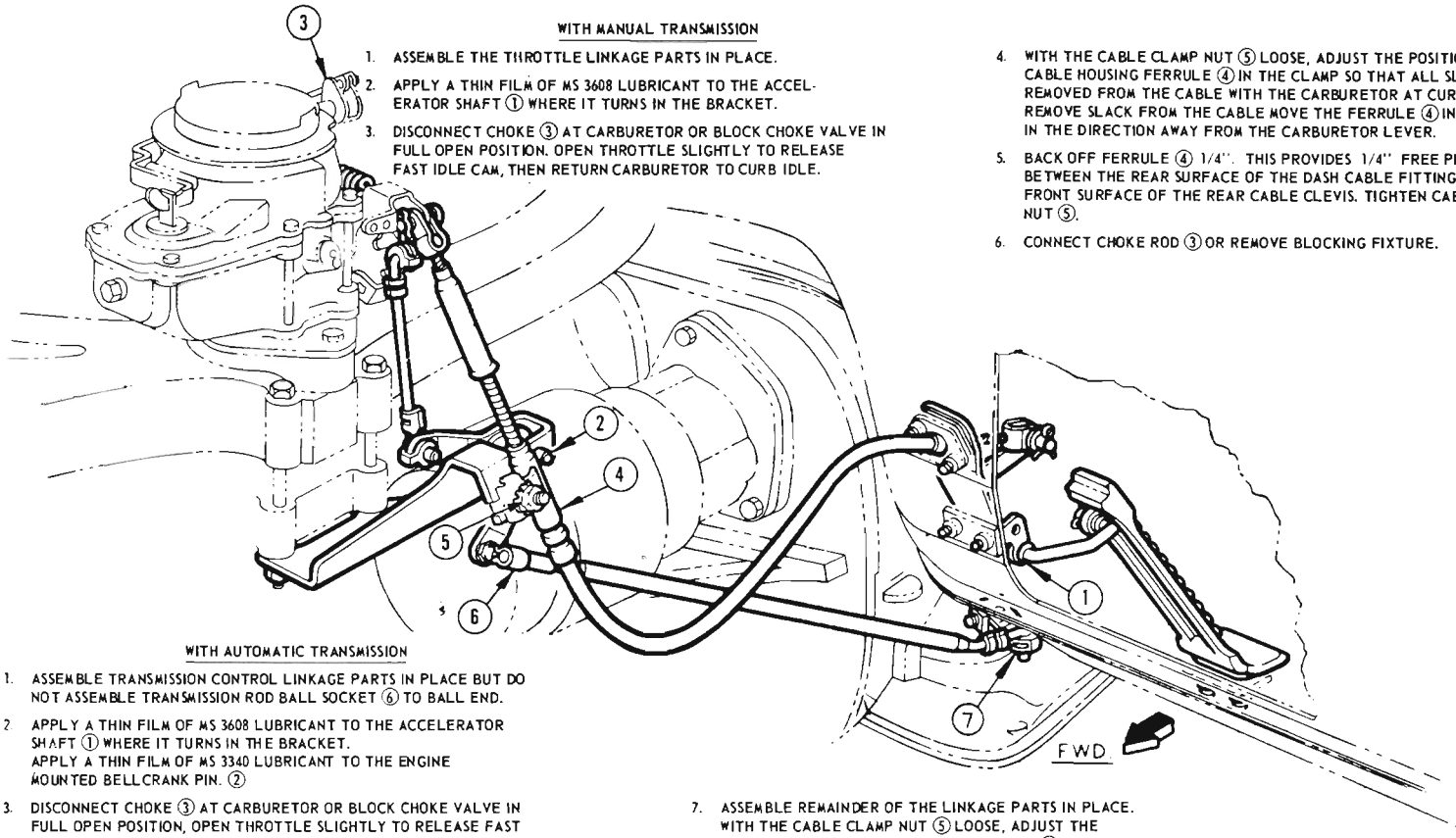
1. ASSEMBLE THE LINKAGE PARTS IN PLACE BUT DO NOT ASSEMBLE BALL JOINT SOCKET (5) TO BALL END AT THE TORQUE SHAFT BELLCRANK.
2. APPLY A LIGHT FILM OF MS 3608 LUBRICANT TO THE FOLLOWING PARTS:
   A. THE OUTSIDE SURFACE OF THE CARBURETOR LEVER ISOLATOR GROMMET (1)
   B. THE TORQUE SHAFT AT THE FIREWALL MOUNTED PLASTIC BUSHING (2)
   C. THE BALL STUD ON THE TORQUE SHAFT REAR LEVER (3) WHICH IS LOCATED INSIDE THE CAR.
3. DISCONNECT CHOKE AT CARBURETOR (4) OR BLOCK CHOKE VALVE IN FULL OPEN POSITION. OPEN THROTTLE SLIGHTLY TO RELEASE FAST IDLE CAM, THEN RETURN THROTTLE TO CURB IDLE.
4. WITH THE LOCK NUT (8) LOOSE IN THE TRANSMISSION ROD, INSERT A 3/16" DIAMETER ROD (7) APPROXIMATELY 4" LONG IN THE HOLES PROVIDED IN THE TRANSMISSION ROD BELLCRANK BRACKET AND LEVER ASSEMBLY.
5. MOVE THE TRANSMISSION LEVER (9) FORWARD AGAINST THE STOP AND TIGHTEN THE TRANSMISSION ROD LOCK NUT (8)
6. DISCONNECT THE TOP END OF THE ACCELERATOR PEDAL ROD. (6) ADJUST THE LENGTH OF THIS ROD TO PROVIDE A PEDAL ANGLE OF 111° TO 113° TO INCREASE PEDAL ANGLE, INCREASE THE LENGTH OF THIS ROD BY MEANS OF THE SCREW ADJUSTMENT. REINSTALL THE TOP END OF THE ROD (6)
7. REMOVE THE 3/16" DIAMETER ROD (7) FROM THE TRANSMISSION ROD BRACKET AND LEVER ASSEMBLY. ADJUST THE LENGTH OF THE TRANSMISSION BELLCRANK TO TORQUE SHAFT ROD BY MEANS OF THE SCREW ADJUSTMENT AT TOP END. THE CORRECT ROD LENGTH ALLOWS THE BALL SOCKET TO LINE UP WITH THE BALL END WHEN THE ROD IS HELD UPWARD AGAINST THE TRANSMISSION STOP.
8. INSTALL THE BALL SOCKET ON TORQUE SHAFT LEVER BALL END (5)
9. CONNECT CHOKE ROD (4) OR REMOVE BLOCKING FIXTURE.

WITH MANUAL TRANSMISSION

1. ASSEMBLE THE THROTTLE LINKAGE PARTS IN PLACE.
2. APPLY A LIGHT FILM OF MS 3608 LUBRICANT TO THE FOLLOWING PARTS:
   A. THE OUTSIDE SURFACE OF THE CARBURETOR LEVER ISOLATOR GROMMET (1)
   B. THE TORQUE SHAFT AT THE FIREWALL MOUNTED PLASTIC BUSHING (2)
   C. THE BALL STUD ON THE TORQUE SHAFT REAR LEVER (3) WHICH IS LOCATED INSIDE THE CAR.
3. DISCONNECT CHOKE AT CARBURETOR (4) OR BLOCK CHOKE VALVE IN FULL OPEN POSITION. OPEN THROTTLE SLIGHTLY TO RELEASE FAST IDLE CAM, THEN RETURN THROTTLE TO CURB IDLE.
4. DISCONNECT TOP END OF ACCELERATOR PEDAL ROD. (6) ADJUST THE LENGTH OF THIS ROD TO PROVIDE A PEDAL ANGLE OF 111° TO 113°. TO INCREASE PEDAL ANGLE, INCREASE THE LENGTH OF THIS ROD BY MEANS OF THE SCREW ADJUSTMENT. REINSTALL THE TOP END OF THE ROD (6)
   CONNECT CHOKE (4) ROD OR REMOVE BLOCKING FIXTURE.

63x363

Fig. 1—Throttle Linkage Adjustment (170-225 Cu. In. Engine)



WITH MANUAL TRANSMISSION

1. ASSEMBLE THE THROTTLE LINKAGE PARTS IN PLACE.
2. APPLY A THIN FILM OF MS 3608 LUBRICANT TO THE ACCELERATOR SHAFT ① WHERE IT TURNS IN THE BRACKET.
3. DISCONNECT CHOKE ③ AT CARBURETOR OR BLOCK CHOKE VALVE IN FULL OPEN POSITION. OPEN THROTTLE SLIGHTLY TO RELEASE FAST IDLE CAM, THEN RETURN CARBURETOR TO CURB IDLE.
4. WITH THE CABLE CLAMP NUT ⑤ LOOSE, ADJUST THE POSITION OF THE CABLE HOUSING FERRULE ④ IN THE CLAMP SO THAT ALL SLACK IS REMOVED FROM THE CABLE WITH THE CARBURETOR AT CURB IDLE. TO REMOVE SLACK FROM THE CABLE MOVE THE FERRULE ④ IN THE CLAMP IN THE DIRECTION AWAY FROM THE CARBURETOR LEVER.
5. BACK OFF FERRULE ④ 1/4". THIS PROVIDES 1/4" FREE PLAY BETWEEN THE REAR SURFACE OF THE DASH CABLE FITTING AND THE FRONT SURFACE OF THE REAR CABLE CLEVIS. TIGHTEN CABLE CLAMP NUT ⑤.
6. CONNECT CHOKE ROD ③ OR REMOVE BLOCKING FIXTURE.

WITH AUTOMATIC TRANSMISSION

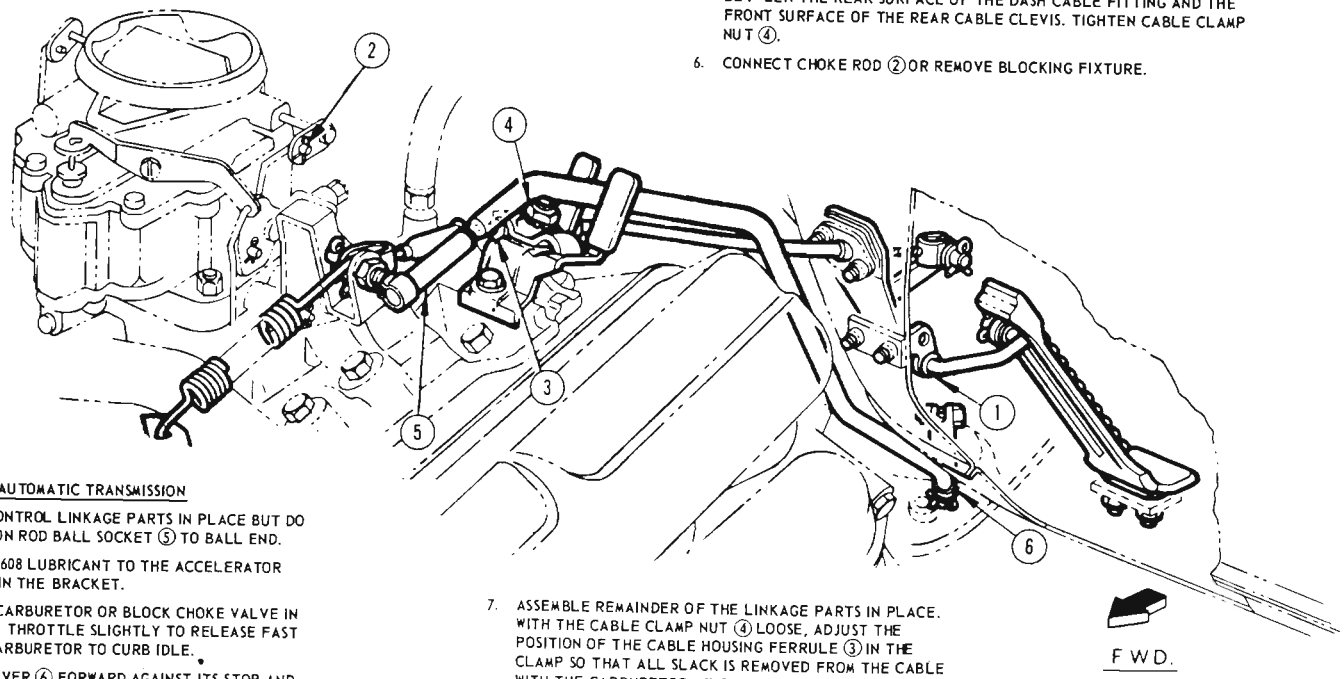
1. ASSEMBLE TRANSMISSION CONTROL LINKAGE PARTS IN PLACE BUT DO NOT ASSEMBLE TRANSMISSION ROD BALL SOCKET ⑥ TO BALL END.
2. APPLY A THIN FILM OF MS 3608 LUBRICANT TO THE ACCELERATOR SHAFT ① WHERE IT TURNS IN THE BRACKET.
   APPLY A THIN FILM OF MS 3340 LUBRICANT TO THE ENGINE MOUNTED BELLCRANK PIN. ②
3. DISCONNECT CHOKE ③ AT CARBURETOR OR BLOCK CHOKE VALVE IN FULL OPEN POSITION, OPEN THROTTLE SLIGHTLY TO RELEASE FAST IDLE CAM, THEN RETURN CARBURETOR TO CURB IDLE.
4. HOLD THE TRANSMISSION LEVER ⑦ FORWARD AGAINST ITS STOP AND ADJUST THE LENGTH OF THE TRANSMISSION ROD BY MEANS OF THE THREADED ADJUSTMENT ⑥ AT THE UPPER END. THE BALL SOCKET MUST LINE UP DIRECTLY WITH THE BALL END WITHOUT EXERTING ANY FORWARD FORCE ON THE ROD. THE BALL SOCKET MUST BE AT THE SAME HEIGHT AS THE BALL END WHEN CHECKING ROD LENGTH.
5. LENGTHEN ROD BY ONE TURN OF THE ADJUSTMENT. ⑥
6. ASSEMBLE BALL SOCKET ⑥ TO BALL END. WHEN THE CARBURETOR THROTTLE IS OPENED, THE TRANSMISSION SHOULD BEGIN ITS TRAVEL AT THE SAME TIME WITH NO VERTICAL MOVEMENT OF THE LEVER OR VERTICAL MOVEMENT OF THE ROD IN THE LEVER.
7. ASSEMBLE REMAINDER OF THE LINKAGE PARTS IN PLACE. WITH THE CABLE CLAMP NUT ⑤ LOOSE, ADJUST THE POSITION OF THE CABLE HOUSING FERRULE ④ IN THE CLAMP SO THAT ALL SLACK IS REMOVED FROM THE CABLE WITH THE CARBURETOR AT CURB IDLE. TO REMOVE SLACK FROM THE CABLE, MOVE THE FERRULE ④ IN THE CLAMP IN THE DIRECTION AWAY FROM THE CARBURETOR LEVER.
8. BACK OFF FERRULE ④ 1/4". THIS PROVIDES 1/4" FREE PLAY BETWEEN THE REAR SURFACE OF THE DASH CABLE FITTING AND THE FRONT SURFACE OF THE REAR CABLE CLEVIS. TIGHTEN CLAMP NUT ⑤.
9. ROUTE CABLE SO THAT IT DOES NOT INTERFERE WITH THE TRANSMISSION ROD THROUGHOUT ITS FULL TRAVEL.
10. CONNECT CHOKE ROD ③ OR REMOVE BLOCKING FIXTURE.

63x364 A

Fig. 2—Throttle Linkage Adjustment (225 Cu. In. Engine)

WITH MANUAL TRANSMISSION

1. ASSEMBLE THE THROTTLE LINKAGE PARTS IN PLACE.
2. APPLY A THIN FILM OF MS 3608 LUBRICANT TO THE ACCELERATOR SHAFT (1) WHERE IT TURNS IN THE BRACKET.
3. DISCONNECT CHOKE (2) AT CARBURETOR OR BLOCK CHOKE VALVE IN FULL OPEN POSITION. OPEN THROTTLE SLIGHTLY TO RELEASE FAST IDLE CAM, THEN RETURN CARBURETOR TO CURB IDLE.
4. WITH THE CABLE CLAMP NUT (4) LOOSE, ADJUST THE POSITION OF THE CABLE HOUSING FERRULE (3) IN THE CLAMP SO THAT ALL SLACK IS REMOVED FROM THE CABLE WITH THE CARBURETOR AT CURB IDLE. TO REMOVE SLACK FROM THE CABLE MOVE THE FERRULE (3) IN THE CLAMP IN THE DIRECTION AWAY FROM THE CARBURETOR LEVER.
5. BACK OFF FERRULE (3) 1/4". THIS PROVIDES 1/4" FREE PLAY BETWEEN THE REAR SURFACE OF THE DASH CABLE FITTING AND THE FRONT SURFACE OF THE REAR CABLE CLEVIS. TIGHTEN CABLE CLAMP NUT (4).
6. CONNECT CHOKE ROD (2) OR REMOVE BLOCKING FIXTURE.



WITH AUTOMATIC TRANSMISSION

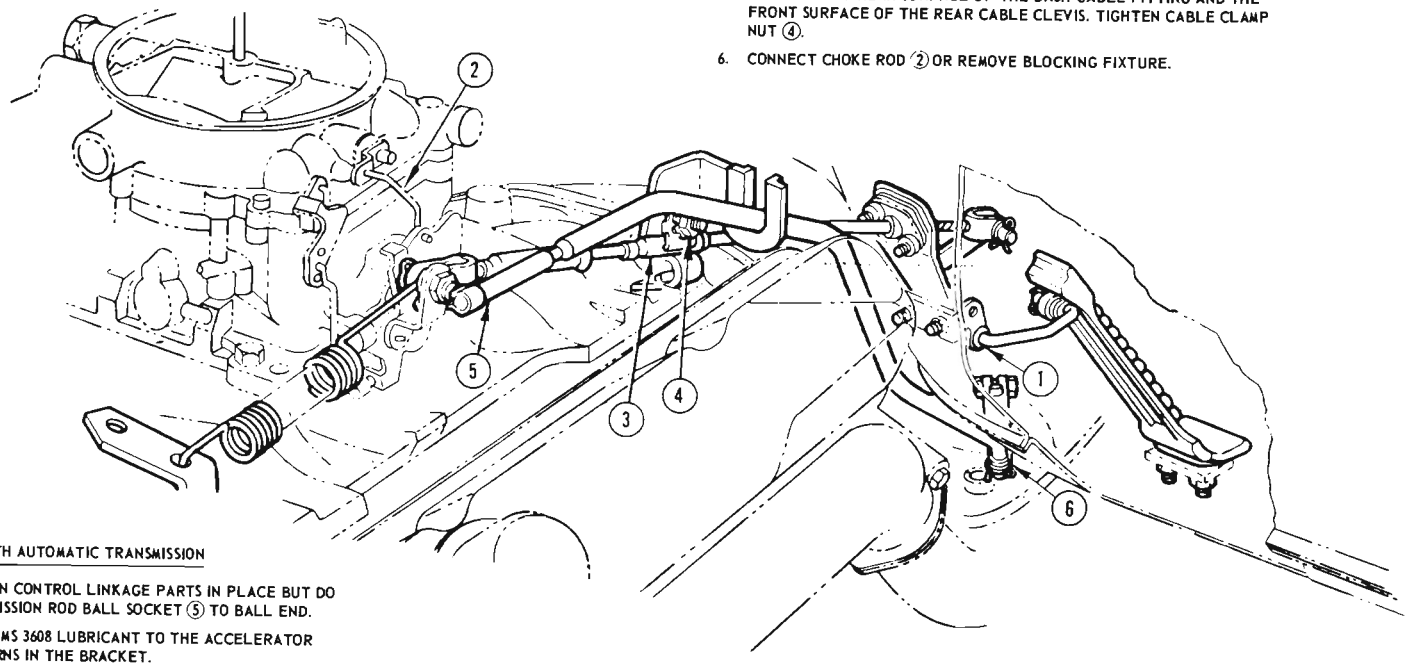
1. ASSEMBLE TRANSMISSION CONTROL LINKAGE PARTS IN PLACE BUT DO NOT ASSEMBLE TRANSMISSION ROD BALL SOCKET (5) TO BALL END.
2. APPLY A THIN FILM OF MS 3608 LUBRICANT TO THE ACCELERATOR SHAFT (1) WHERE IT TURNS IN THE BRACKET.
3. DISCONNECT CHOKE (2) AT CARBURETOR OR BLOCK CHOKE VALVE IN FULL OPEN POSITION, OPEN THROTTLE SLIGHTLY TO RELEASE FAST IDLE CAM, THEN RETURN CARBURETOR TO CURB IDLE.
4. HOLD THE TRANSMISSION LEVER (6) FORWARD AGAINST ITS STOP AND ADJUST THE LENGTH OF THE TRANSMISSION ROD BY MEANS OF THE THREADED ADJUSTMENT (5) AT THE UPPER END. THE BALL SOCKET MUST LINE UP DIRECTLY WITH THE BALL END WITHOUT EXERTING ANY FORWARD FORCE ON THE ROD. THE BALL SOCKET MUST BE AT THE SAME HEIGHT AS THE BALL END WHEN CHECKING ROD LENGTH.
5. LENGTHEN ROD BY ONE TURN OF THE ADJUSTMENT. (5)
6. ASSEMBLE BALL SOCKET (5) TO BALL END. WHEN THE CARBURETOR THROTTLE IS OPENED, THE TRANSMISSION SHOULD BEGIN ITS TRAVEL AT THE SAME TIME WITH NO VERTICAL MOVEMENT OF THE LEVER OR VERTICAL MOVEMENT OF THE ROD IN THE LEVER.
7. ASSEMBLE REMAINDER OF THE LINKAGE PARTS IN PLACE. WITH THE CABLE CLAMP NUT (4) LOOSE, ADJUST THE POSITION OF THE CABLE HOUSING FERRULE (3) IN THE CLAMP SO THAT ALL SLACK IS REMOVED FROM THE CABLE WITH THE CARBURETOR AT CURB IDLE. TO REMOVE SLACK FROM THE CABLE, MOVE THE FERRULE (3) IN THE CLAMP IN THE DIRECTION AWAY FROM THE CARBURETOR LEVER.
8. BACK OFF FERRULE (3) 1 4". THIS PROVIDES 1 4" FREE PLAY BETWEEN THE REAR SURFACE OF THE DASH CABLE FITTING AND THE FRONT SURFACE OF THE REAR CABLE CLEVIS. TIGHTEN CLAMP NUT (4).
9. ROUTE CABLE SO THAT IT DOES NOT INTERFERE WITH THE TRANSMISSION ROD THROUGHOUT ITS FULL TRAVEL.
10. CONNECT CHOKE ROD (2) OR REMOVE BLOCKING FIXTURE.

63x365A

Fig. 3—Throttle Linkage Adjustment (318 Cu. In. Engine)

WITH MANUAL TRANSMISSION

1. ASSEMBLE THE THROTTLE LINKAGE PARTS IN PLACE.
2. APPLY A THIN FILM OF MS 3608 LUBRICANT TO THE ACCELERATOR SHAFT ① WHERE IT TURNS IN THE BRACKET.
3. DISCONNECT CHOKE ② AT CARBURETOR OR BLOCK CHOKE VALVE IN FULL OPEN POSITION. OPEN THROTTLE SLIGHTLY TO RELEASE FAST IDLE CAM, THEN RETURN CARBURETOR TO CURB IDLE.
4. WITH THE CABLE CLAMP NUT ④ LOOSE, ADJUST THE POSITION OF THE CABLE HOUSING FERRULE ③ IN THE CLAMP SO THAT ALL SLACK IS REMOVED FROM THE CABLE WITH THE CARBURETOR AT CURB IDLE. TO REMOVE SLACK FROM THE CABLE MOVE THE FERRULE ③ IN THE CLAMP IN THE DIRECTION AWAY FROM THE CARBURETOR LEVER.
5. BACK OFF FERRULE ③ 1/4". THIS PROVIDES 1/4" FREE PLAY BETWEEN THE REAR SURFACE OF THE DASH CABLE FITTING AND THE FRONT SURFACE OF THE REAR CABLE CLEVIS. TIGHTEN CABLE CLAMP NUT ④.
6. CONNECT CHOKE ROD ② OR REMOVE BLOCKING FIXTURE.



WITH AUTOMATIC TRANSMISSION

1. ASSEMBLE TRANSMISSION CONTROL LINKAGE PARTS IN PLACE BUT DO NOT ASSEMBLE TRANSMISSION ROD BALL SOCKET ⑤ TO BALL END.
2. APPLY A THIN FILM OF MS 3608 LUBRICANT TO THE ACCELERATOR SHAFT ① WHERE IT TURNS IN THE BRACKET.
3. DISCONNECT CHOKE ② AT CARBURETOR OR BLOCK CHOKE VALVE IN FULL OPEN POSITION, OPEN THROTTLE SLIGHTLY TO RELEASE FAST IDLE CAM, THEN RETURN CARBURETOR TO CURB IDLE.
4. HOLD THE TRANSMISSION LEVER ⑥ FORWARD AGAINST ITS STOP AND ADJUST THE LENGTH OF THE TRANSMISSION ROD BY MEANS OF THE THREADED ADJUSTMENT ⑤ AT THE UPPER END. THE BALL SOCKET MUST LINE UP DIRECTLY WITH THE BALL END WITHOUT EXERTING ANY FORWARD FORCE ON THE ROD. THE BALL SOCKET MUST BE AT THE SAME HEIGHT AS THE BALL END WHEN CHECKING ROD LENGTH.
5. LENGTHEN ROD BY ONE TURN OF THE ADJUSTMENT. ⑤
6. ASSEMBLE BALL SOCKET ⑤ TO BALL END. WHEN THE CARBURETOR THROTTLE IS OPENED, THE TRANSMISSION SHOULD BEGIN ITS TRAVEL AT THE SAME TIME WITH NO VERTICAL MOVEMENT OF THE LEVER OR VERTICAL MOVEMENT OF THE ROD IN THE LEVER.
7. ASSEMBLE REMAINDER OF THE LINKAGE PARTS IN PLACE. WITH THE CABLE CLAMP NUT ④ LOOSE, ADJUST THE POSITION OF THE CABLE HOUSING FERRULE ③ IN THE CLAMP SO THAT ALL SLACK IS REMOVED FROM THE CABLE WITH THE CARBURETOR AT CURB IDLE. TO REMOVE SLACK FROM THE CABLE, MOVE THE FERRULE ③ IN THE CLAMP IN THE DIRECTION AWAY FROM THE CARBURETOR LEVER.
8. BACK OFF FERRULE ③ 1/4". THIS PROVIDES 1/4" FREE PLAY BETWEEN THE REAR SURFACE OF THE DASH CABLE FITTING AND THE FRONT SURFACE OF THE REAR CABLE CLEVIS. TIGHTEN CLAMP NUT ④.
9. ROUTE CABLE SO THAT IT DOES NOT INTERFERE WITH THE TRANSMISSION ROD THROUGHOUT ITS FULL TRAVEL.
10. CONNECT CHOKE ROD ② OR REMOVE BLOCKING FIXTURE..

63x366A

Fig. 4—Throttle Linkage Adjustment (361-383-413-426 Cu. In. Engines)

PART 7

FUEL PUMP AND TANK

FUEL PUMP

Three different models of fuel pumps are used in production. The same basic design applies to all three models. The service procedures for testing are the same.

Fuel pump model MS-3674S, shown in Figure 1, is used exclusively on the 170/225 cubic inch 6 cylinder engine. Model MS-3673S, shown in Figure 2 is used on the 318 cubic inch V-8 engine. Model MS-3672S, shown in Figure 3, is used on the 361-383 cubic inch engine.

The fuel pumps are driven by an eccentric cam that is cast on the camshaft in the 170/225 and 361-383 cubic inch engines, or by a pressed steel eccentric cam mounted on the gear end of the camshaft in the 318 cubic inch engine.

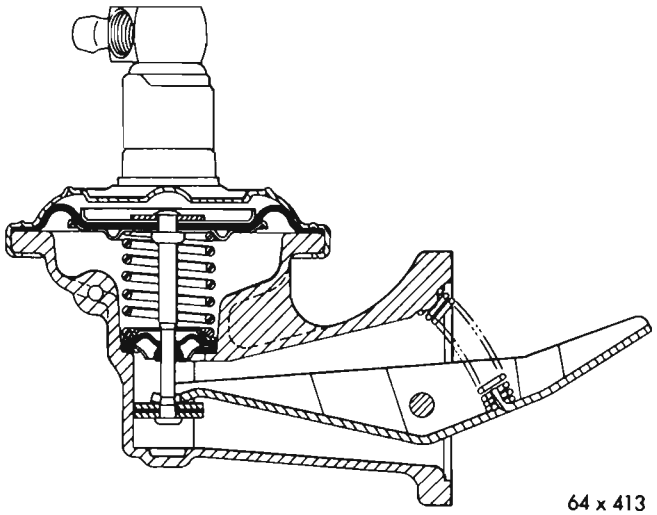


Fig. 1—Fuel Pump Assembly (170-225 Cu. In. Engine)

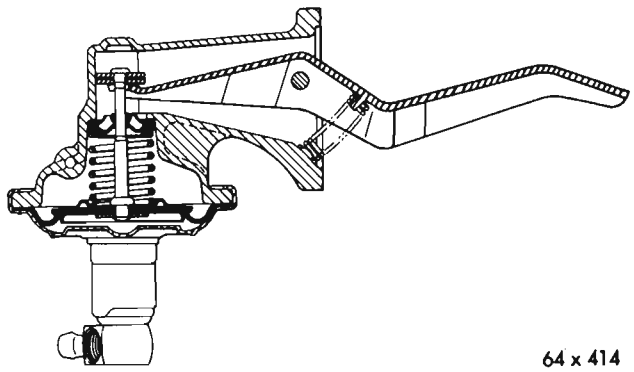


Fig. 2—Fuel Pump Assembly (318 Cu. In. Engine)

As the camshaft rotates, the eccentric cam presses down on the pump rocker arm. (On the 361-383 cubic inch engine, a push rod operates between the camshaft and the fuel pump rocker arm). This action lifts the pull rod and diaphragm upwards against the fuel pump main spring, thus creating a vacuum in the valve housing and opens the inlet valve and fuel is drawn into the valve housing chamber. On the return stroke the main spring forces the diaphragm to the **down** position, which closes the inlet valve and expels the fuel in the valve housing chamber through the outlet valve, to the fuel filter and the carburetor.

The fuel pump is of the pressed steel type and cannot be disassembled for service. If a pump malfunction occurs, remove the old pump and install a new one.

The fuel filters (ceramic or paper) should be changed every 16,000 miles, to insure having an unrestricted flow of fuel at all times. **Do not attempt to clean.**

1. TESTING FUEL PUMPS *(On the Engine)*

If the fuel pump fails to supply fuel properly to the carburetor, the following tests should be made before removing the fuel pump from the vehicle.

If leakage is not apparent, test the pump for pressure.

Pressure Test

(1) Insert a "T" fitting in the fuel line at the

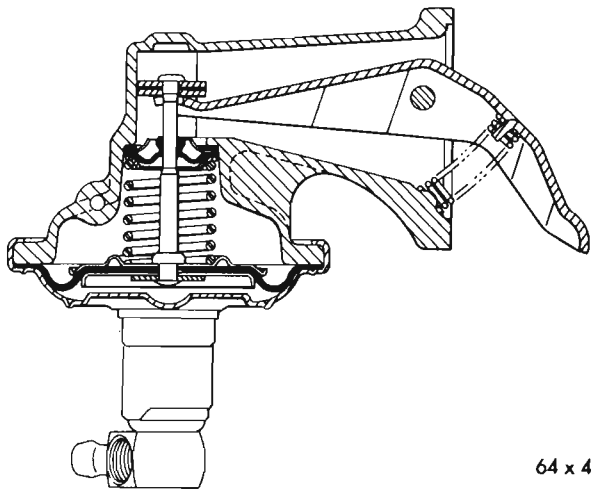


Fig. 3—Fuel Pump Assembly (361-383-413 and 426 Cu. In. Engines)

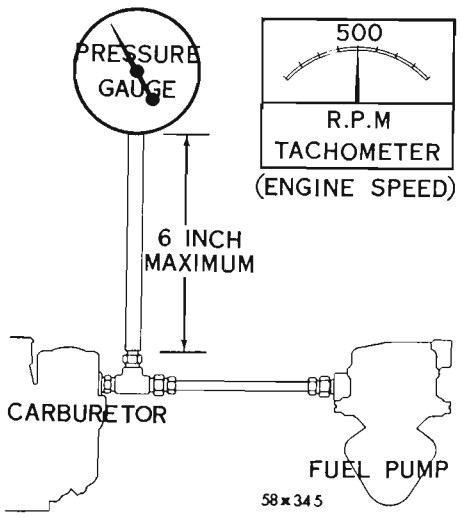


Fig. 4—Pressure Testing the Fuel Pump

carburetor, as shown in Figure 4.

(2) Connect a 6 inch piece of hose between the "T" fitting and gauge Tool C-3411. (The hose should not exceed 6 inches. A longer hose may collect fuel and the additional weight of the fuel would be added to the pressure of the pump and result in an inaccurate reading).

(3) Vent the pump for a few seconds (this relieves the air trapped in the fuel chamber). If this is not done, the pump will not operate at full capacity and a low pressure reading will result.

(4) Connect a tachometer, then start the engine and run at 500 rpm. The reading should be from 3½ to 5 psi (or from 5 to 7 psi, depending on pump) and remain constant or return to zero, very, very slowly when the engine is stopped. An instant drop to zero indicates a leaky outlet valve. If the pressure is too low a weak diaphragm main spring, or improper assembly of the diaphragm may be the cause. If the pressure is too high, the main spring is too strong.

Vacuum Test

The vacuum test should be made with the fuel line disconnected from the carburetor. (This will allow the pump to operate at full capacity, which it must do to prime a dry carburetor).

Volume Test

The fuel pump should supply 1 quart of fuel in 1 minute or less at 500 rpm.

Inlet Valve Test

To test the inlet valve, connect a vacuum gauge on the inlet fitting while the line is disconnected:

(1) Start the engine or turn over with starting motor. There should be a noticeable vacuum present, not alternated by blowback.

(2) If blowback is present, the inlet valve is not seating properly and should be cleaned, or a new valve body installed.

If the fuel pump does not perform to the above test requirements, the fuel pump should be removed from the vehicle.

FUEL TANK

The fuel tank on both the conventional and the Station Wagon Models (106" wheelbase) is located at the rear of the body, under the trunk compartment floor, as shown in Figures 1 or 2. The filler tube is located in the left rear quarter panel.

The fuel tank on all models (116" wheelbase) except the Station Wagon Models, is located at the rear of the body under the trunk compartment floor, as shown in Figures 3 and 4. In the Station Wagon Models the fuel tank is mounted in the left rear quarter panel beyond the wheel house, as shown in Figure 5.

The filler tube on the conventional models is accessible through the center of the deck opening lower panel. Station Wagon models fill at the left rear upper quarter panel between the quarter post and the fin.

NOTE: If a vehicle is to stored for any appreciable length of time, the gasoline should be drained from the entire system in order to prevent gum formation. If the vehicle has been undercoated, be sure the tank vent tube is open. If this vent is plugged, a collapsed fuel tank will result.

The fuel tank on all 106" wheelbase models has a 18 gallon capacity. The fuel tank on all conventional 116" W/B Models has a 19 gallon capacity. (The Station Wagon tank capacity is 21 gallons). The fuel tank is fitted with a gauge unit, including the suction pipe, as shown in Figure 6. The filter on the end of the suction pipe is a replaceable unit and prevents the entry of water or foreign material. When installing a tank unit, be sure the filter is pushed down on the pipe until seated.

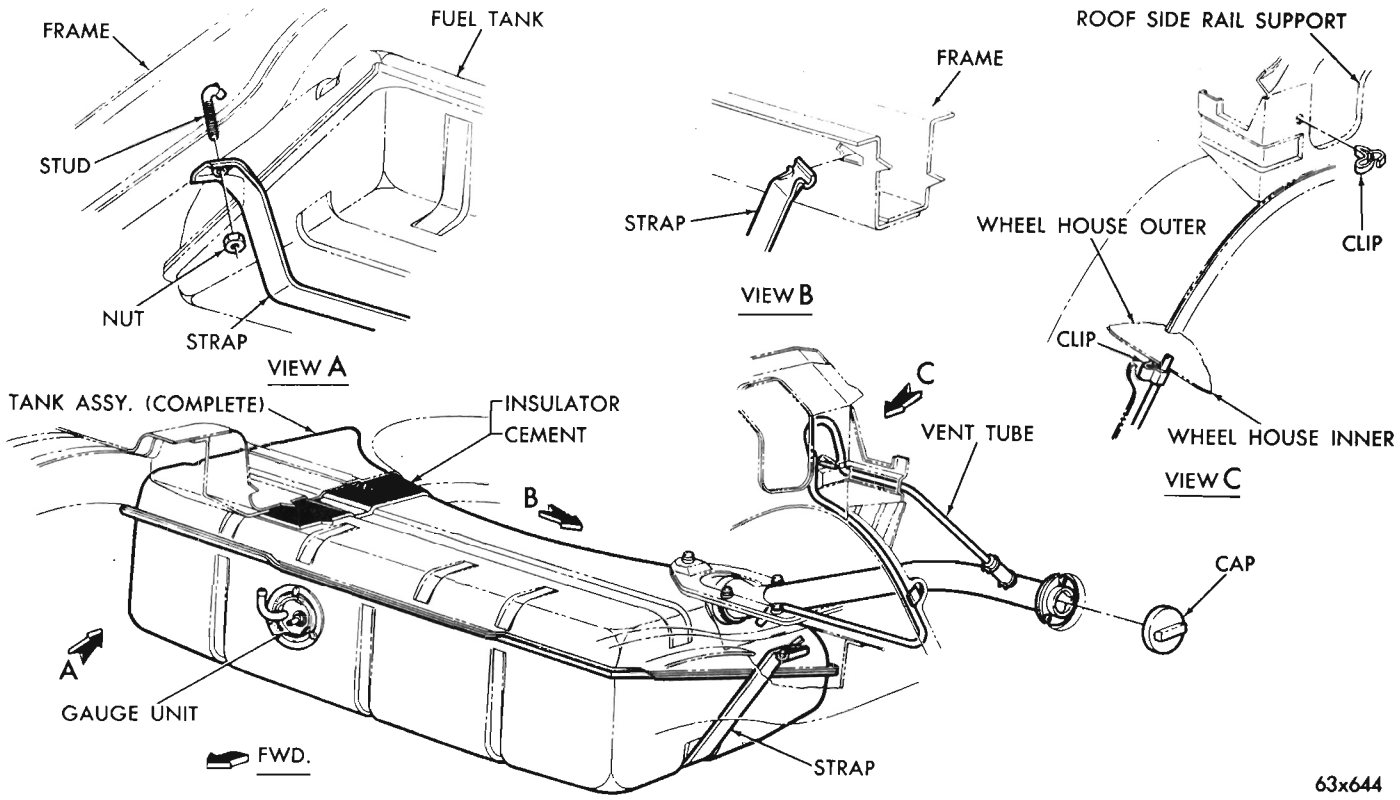


Fig. 1—Fuel Tank Assembly Installed (106" W/B Models)

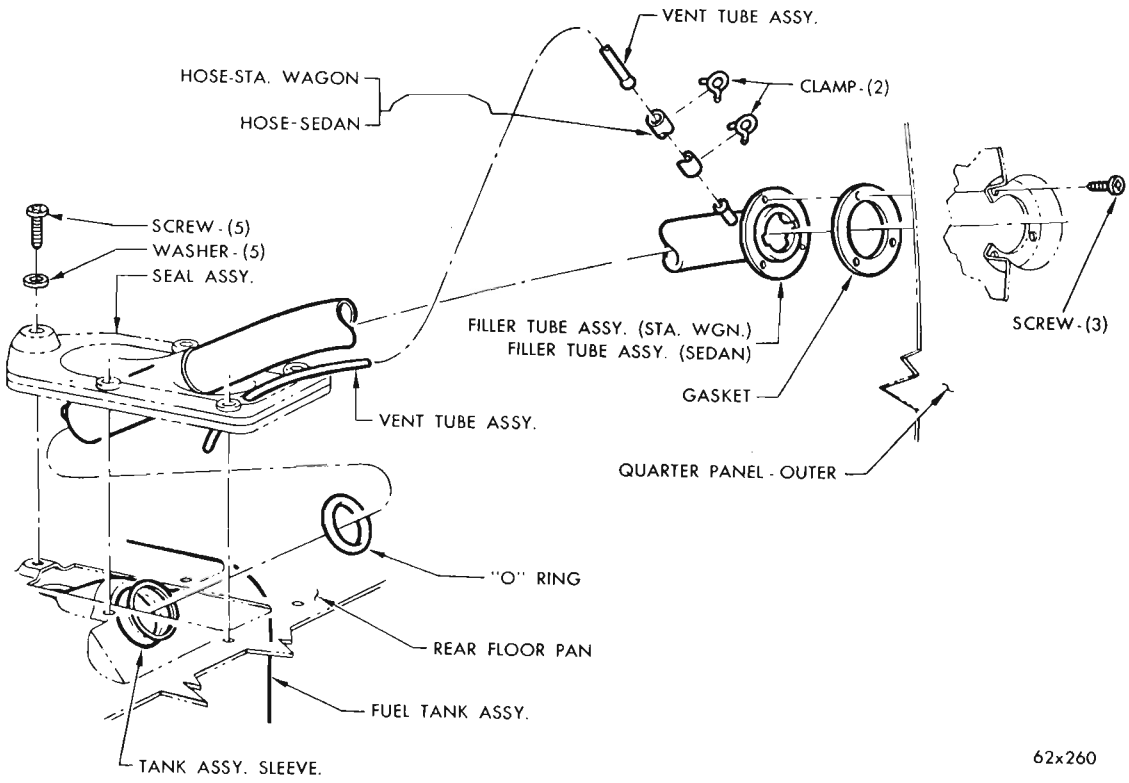


Fig. 2—Filler Tube Assembly (Disassembled View) (106" W/B Models)

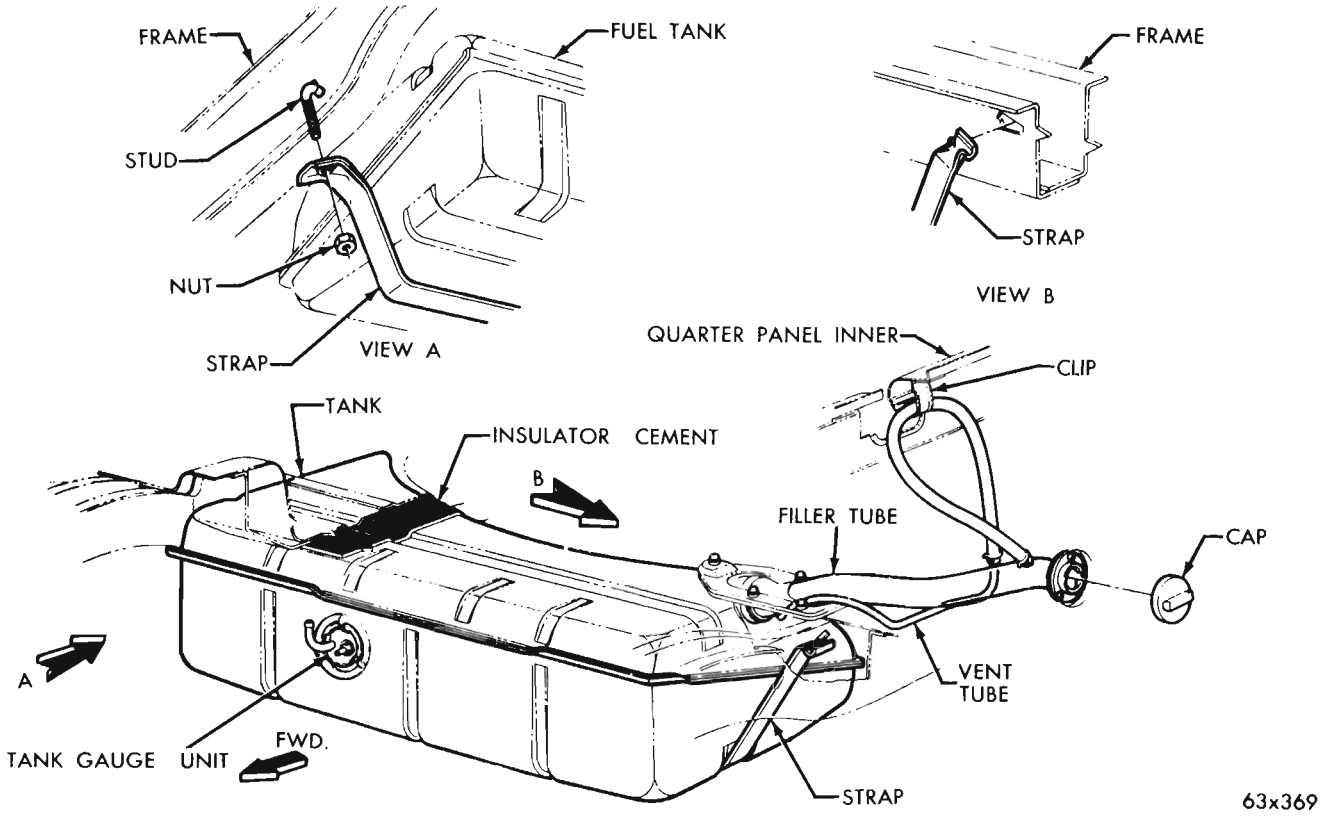


Fig. 3—Fuel Tank Assembly (Installation) Station Wagon 106" W/B Models

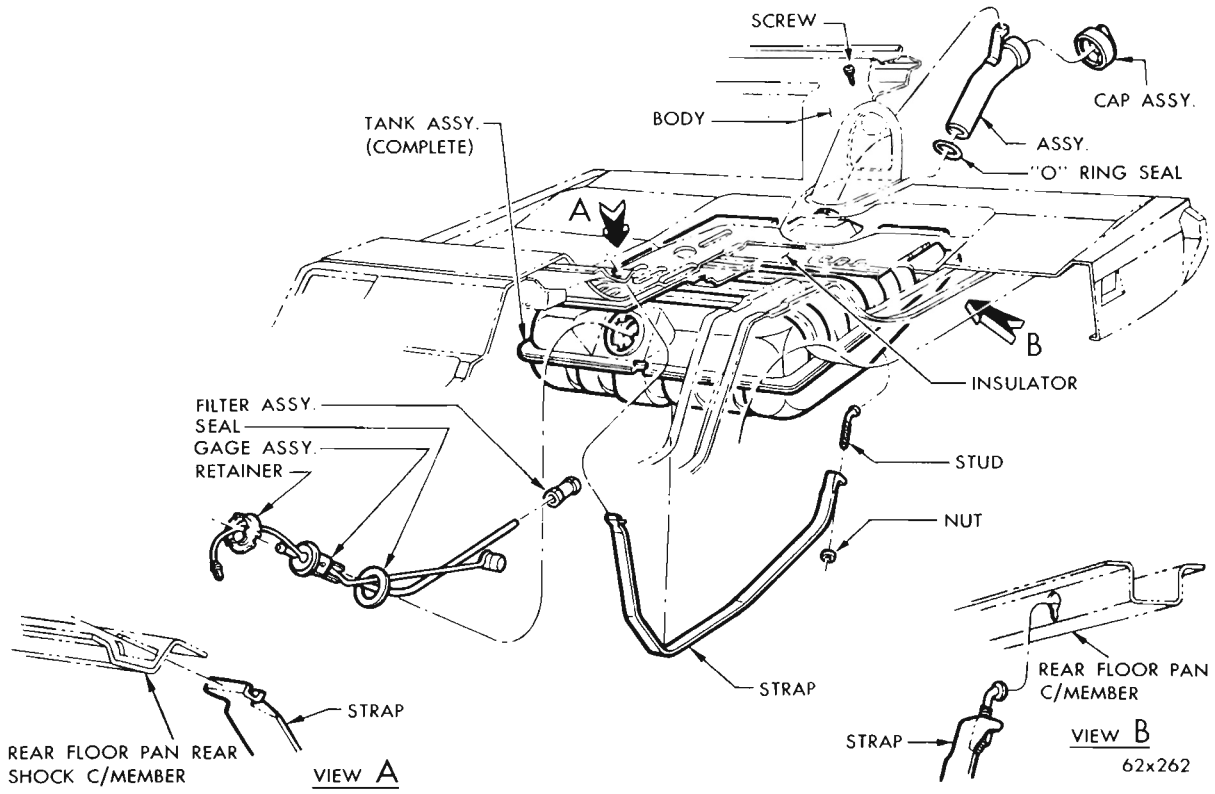


Fig. 4—Fuel Tank Assembly (Installation) 116" W/B Models

SERVICE PROCEDURES

1. FUEL TANK

Removal—(106" W/B Models)

Should it become necessary to remove a fuel tank for repair, gauge removal, or installation of a new tank, refer to Figures 1 and 2, then proceed as follows:

(1) Drain the fuel tank dry by disconnecting the fuel line at the pump and then connect a siphon tube. Collect the drained fuel in a suitable container. Disconnect the fuel line and the wire lead to the gauge unit. (Right side near top of tank).

(2) Disconnect the vent tube from the filler tube at the connector.

(3) Remove the 3 screws that hold the filler tube and gasket, to the rear quarter panel.

(4) Remove the 5 screws and washers that attach the filler tube seal to the floor pan, then remove the end of the vent tube from the seal.

(5) Grasp the filler tube with both hands, twist the tube, and at the same time, force downward into the tank, until the end of the tube clears the quarter panel. Remove the gasket. (If the tube is frozen in the tank, use a rubber lubricant around the joint and work into the "O" ring recess, after sliding the dust shield out of the way).

(6) Twist (or rotate) the filler tube approximately 180 degrees, then work tube carefully out of the tank and dust shield seal. Remove tube from the inside of the trunk compartment.

CAUTION: Do not pull the tube from side to side or up and down, as rough treatment can cause the soldered sleeve to break its seal to the tank and thus cause a leak.

(7) Remove the nut that holds the tank retaining strap to the "J" bolt. Allow the strap to drop or hang then lower the tank and remove from under the vehicle.

(8) Remove the tank gauge unit, using spanner wrench Tool C-3582. Slide the gauge assembly out of the fuel tank. Discard the gasket.

(9) If necessary, test the operation of the fuel gauge, as described in Group 8, "Electrical System".

Installation

Before installing the fuel gauge, inspect the condi-

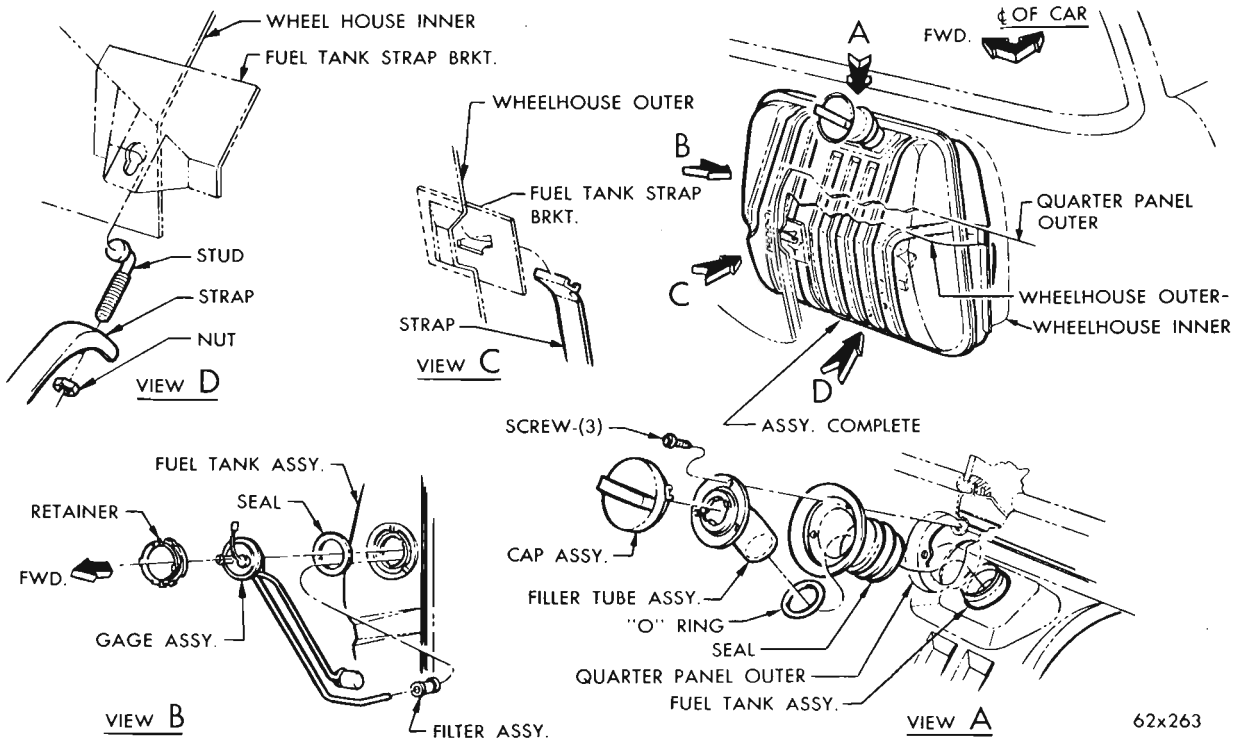


Fig. 5—Fuel Tank Assembly (Installation) 116" W/B Models (Station Wagon)

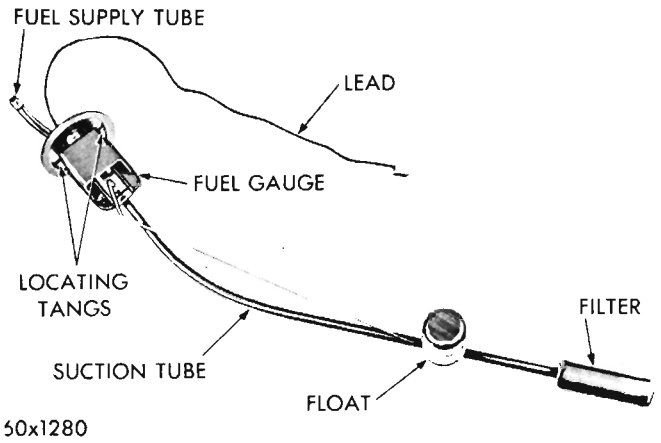


Fig. 6—Fuel Tank Sending Unit

tion of the filter on the end of the suction tube. If the filter is plugged, install a new filter.

(1) Install a new "O" ring in the tank filler tube sleeve. Insert a new gasket in the fuel gauge opening recess, then slide the gauge into the tank. Align the positioning tangs on the gauge with those in the tank. Install the lockring, then tighten securely, using Tool C-3582.

(2) Slide the tank under the vehicle and up into position. Hold the tank in this position, then raise the retaining strap and thread onto the "J" bolt. Install the attaching nut, and tighten securely. (Not over 60 inch pounds torque).

(3) Lubricate the "O" ring, using a suitable rubber lubricant, then slide the filler tube down through the dust seal and into the tank, far enough to clear the quarter panel. Twist (or rotate) the filler tube 180 degrees and align with opening in quarter panel. Install a new gasket over the end of the tube, then, slowly withdraw tube from the tank and into position against the quarter panel. Align the attaching screw holes; install the screws and tighten securely. Slide the vent tube through the seal.

(4) If the dust seal was disturbed during the removal operation, realign and tighten the attaching screws securely.

(5) Reconnect the vent tube to the filler tube connector.

(6) Reconnect the fuel supply line and the wire lead to the gauge.

(7) Refill the tank and test for leaks.

2. FUEL TANK

Disassembly—(116" W/B Models—Except Station Wagons)

Should it become necessary to remove a fuel tank for repair or installation of a new tank, refer to Figure 4, then proceed as follows:

(1) Drain the fuel tank (using the siphon method), then disconnect the fuel line and the wire lead to the gauge unit.

(2) Remove the screw that attaches the filler tube to the body panel, then, with a twisting motion, pull the filler tube out of the tank. (If the tube is frozen in the tank, use a rubber lubricant around the joint and work into the "O" ring recess).

(3) Remove the nut that holds the tank retaining strap to the "J" bolt. Allow strap to hang, then drop tank and remove from under the vehicle.

(4) Remove the tank unit (gauge), using spanner wrench Tool C-3582. Slide the gauge assembly out of the fuel tank. Discard the gasket.

Installation

Before installing the fuel gauge, inspect the condition of the filter on the end of the suction tube. If the filter is plugged, install a new filter.

To install the fuel tank, refer to Figure 4, then proceed as follows:

(1) Install a new "O" ring in the tank filler tube sleeve. Insert a new gasket in the fuel gauge opening recess, then slide the gauge into the tank. Align the positioning tangs on the gauge with those in the tank. Install the lockring, then tighten securely, using Tool C-3582.

(2) Slide the fuel tank under the vehicle. Raise the tank far enough to engage the filler spout with the opening in the rear panel.

(3) Push the tank toward the rear to fully engage the filler spout in the opening.

(4) Hold the fuel tank in this position, then place the hold down strap in position; feeding the attaching stud through the hole in the end of the strap. Install the nut but do not tighten (2 or 3 threads).

(5) Guide the button head of the stud into the slot in the frame and down into position. Move the tank slightly back and forth; front and rear until the embossed surface of the tank meshes with the embossed surface of the floor pan. (Be sure the insulator is in place). With the tank held in this position, tighten the strap bolt nut to 60 inch pounds.

CAUTION: Do not exceed 60 inch pounds torque, as additional pressure can distort the tank and may cause leaks.

(6) Slide the filler tube down into position through the "O" ring with a twisting motion, until seated firmly in the tank. Align the screw hole and install the attaching screw. Tighten securely.

(7) Connect the lead wire to the tank gauge unit, and reconnect the fuel line. Refill tank and test for leaks.

3. FUEL TANK

Disassembly (106" W/B Station Wagon Models)

Should it become necessary to remove the Station Wagon fuel tank for repair, gauge removal or the installation of a new tank, refer to Figure 3, then proceed as follows:

(1) Drain the fuel tank, by disconnecting the fuel line at the fuel pump and connect a siphon tube. Collect the drained fuel in a suitable container.

(2) Disconnect the fuel line at the tank and the lead wire to the fuel gauge.

(3) Remove the nut that holds the tank retaining strap to the "J" bolt. Allow strap to hang, then, using care, slightly drop the right hand side of the tank and with a twisting motion, work the tank off the end of the filler tube. (If the tube is frozen in the tank, use a rubber lubricant around the joint and work into the "O" ring recess. Drop tank and remove from under the vehicle.

(4) Remove the tank unit (gauge), using spanner wrench Tool C-3582. Slide the gauge assembly out of the fuel tank. Discard the gasket.

If it was found necessary to remove the filler tube for repair or the installation of a new tube, proceed as follows:

(5) Remove the screws that attach the upper trim plate to the quarter panel, to expose the fuel tank vent tube clip.

(6) Reach through the access hole (directly above the filler tube location) with the fingers, and unhook the vent hose from the clip. (Refer to Fig. 3.)

(7) Remove the rear floor mat and raise the spare tire cover (rear floor section), to expose the filler tube, vent tube and seal (filler tube to floor pan).

(8) Remove the screws and washers that attach the filler tube to the inner panel and floor pan seals. Slide both seals toward the center of the filler tube.

(9) Remove the 3 screws that attach the outer end of the filler tube to the outer quarter panel skin.

(10) Withdraw the complete assembly (tube, seals, vent tube and hose) into the luggage area and out of the vehicle. Discard the filler tube to outer skin seal. Inspect the condition of the tube to floor pan and inner panel seals for signs of deterioration or damage. Replace questionable seals with new ones at reassembly.

Installation

Before installing the fuel gauge assembly, inspect the filter on the end of the suction tube. If the filter is plugged, install a new filter.

To install the fuel tank, refer to Figure 3, then proceed as follows:

(1) Install a new gasket in the fuel gauge opening recess, then slide the gauge into the tank. Align the positioning tangs on the gauge with those in the tank. Install the lockring then tighten securely, using Tool C-3582.

(2) Slide the fuel tank under the vehicle and up to meet the filler tube. (Be sure a new "O" ring was installed in the tank). Engage the tank spout with the filler tube, then work the tank onto the tube. Hold in this position, then raise the retaining strap and thread onto the "J" bolt. Install the attaching nut, and tighten to 60 inch pounds.

(3) Reconnect the fuel line and the lead wire to the fuel gauge unit.

(4) Refill the fuel tank and test for leaks.

If the filler tube assembly was removed, it will be necessary to install the tube assembly before installing the tank. To install the filler tube assembly, refer to Figure 3, then proceed as follows:

(1) Place a new seal over the end of the filler tube and a new "O" ring in the tank recess. (Be sure and test the vent hose connections, as a leak at this point may allow fuel odor to enter the passenger compartment).

(2) Slide the filler tube assembly (tube, seals, vent tube and hose) into position. Rotate the filler tube so that it can enter the tank.

(3) Align the screw holes and install screws. Tighten securely.

(4) Position both the inner panel to tube seal and the tube to floor pan seal. Install the attaching screws washers and tighten securely.

(5) Reaching through the access hole, reposition the vent hose over the clip.

(6) Reinstall the trim plate in the quarter panel.

(7) Reinstall the rear floor pan filler and secure with screws.

(8) Reinstall the spare tire cover and the floor mat.

4. FUEL TANK—(116" Station Wagon Models)

Disassembly

Should it become necessary to remove the Station Wagon fuel tank for repair or the installation of a new

tank, refer to Figure 5, then proceed as follows:

(1) Drain the fuel tank (using the siphon method), then disconnect the fuel line and the lead wire to the gauge unit (under the rear fender, behind the wheel house).

(2) Disconnect the left rear shock absorber, then raise the vehicle on a frame contact hoist. (This will allow the rear wheels to hang free).

(3) Remove the left rear wheel.

(4) Remove the screws that attach the stone shield to the lower edge of the wheel house at the rear. Remove the shield.

(5) Remove the filler cap and the filler tube sleeve attaching screws. Using a suitable tool, pry out the filler tube (a press fit in the tank neck seal); being careful not to damage the car finish. Slide the sleeve out of the body opening. Remove the seal from the sleeve and "O" ring from the filler tube.

(6) Remove the nut that holds the tank retaining strap to the "J" bolt. Allow strap to hang.

(7) Slide the tank toward the front of vehicle, then work down and out from under the quarter panel. Reach up under the quarter panel and disengage the hold down strap from the bracket (if strap is to be replaced Refer to Fig. 5).

(8) Loosen the tank gauge unit, using a spanner wrench Tool C-3582. Slide the unit up and out of the tank.

Inspect the condition of the rubber "O" ring. If cracked or deteriorated, install new "O" ring at reassembly.

Installation

Before installing the fuel tank gauge unit, inspect the condition of the filter on the end of the suction tube. If the filler is corroded, install a new filter.

(1) Position the fuel tank gauge unit in the tank, using a new gasket. Tighten securely, using Tool C-3582.

(2) Slide the hold down strap up under the quarter panel, inserting the end of the strap into the slot. Allow the strap to hang.

(3) Install a new "O" ring in the neck of the tank. (Refer to Fig. 5).

(4) Slide the tank up under the quarter panel with the gauge unit facing the front of vehicle and work up into position, then push toward the rear of vehicle (Be sure the embossed side of the tank engages with the embossed surface of the support). Make sure the filler neck is aligned with the opening in the top of the quarter panel. Hold in this position, then raise the retaining strap and thread onto the "J" bolt. Install the attaching nut. Do not tighten.

(5) Place a new seal over the filler tube and down against the flange. Insert the filler tube down into the neck of the tank. Force the tube into the "O" ring until the tube contacts the seal retainer. (Be sure the anchor tab on the tube is aligned with a screw hole). Install screws and tighten securely.

(6) Tighten fuel tank hold down strap bolt to 60 inch-pounds torque.

(7) Install the stone shield, connect the fuel line and lead wire to the gauge unit. Reinstall the button plugs.

(8) Reinstall the left rear wheel.

(9) Lower the vehicle and connect the left rear shock absorber.

(10) Refill the fuel tank and test for leaks.

PART 8—SERVICE DIAGNOSIS

CARBURETOR

Condition	Possible Cause	Correction
Poor Idling	(a) Idle air bleed carbonized or of incorrect size.	(a) Disassemble the carburetor. Then, use compressed air to clear idle bleed after soaking it in a suitable solvent.
	(b) Idle discharged holes plugged or gummed.	(b) Disassemble the carburetor. Then, use compressed air to clear idle discharge holes after soaking the main and throttle bodies in a suitable solvent.
	(c) Throttle body carbonized or worn throttle shaft.	(c) Disassemble the carburetor. Test the throttle valve shaft for wear. If excessive wear is apparent, replace the throttle body assembly.
	(d) Damaged or worn idle mixture needle.	(d) Replace the worn or damaged idle needle. Adjust the air mixture.
	(e) Low grade fuel or incorrect float level.	(e) Test the fuel level in the carburetor. Adjust as necessary to obtain the correct float level.
	(f) Loose main body to throttle body screws.	(f) Tighten the main body to throttle body screws securely to prevent air leaks and cracked housings.
Poor Acceleration	(a) Accelerator pump bypass seat corroded or bad.	(a) Disassemble the carburetor. Clean and inspect accelerator pump by-pass jet. Replace by-pass jet, if it is in questionable condition.
	(b) Accelerator pump piston (or plunger leather too hard, worn, or loose on stem.	(b) Disassemble the carburetor. Replace accelerator pump assembly if leather is hard, cracked or worn. Test follow-up spring for compression.
	(c) Faulty accelerator pump discharge ball.	(c) Disassemble the carburetor. Use compressed air to clear the discharge nozzle and channels after soaking the main body in a suitable solvent. Test the fuel pump capacity.
	(d) Faulty accelerator pump inlet check ball.	(d) Disassemble the carburetor. Test the accelerator pump inlet check ball for poor seat or release. If part is faulty, replace.
	(e) Incorrect fuel or float level.	(e) Test the fuel or float level in the carburetor. Adjust as necessary to obtain correct float level.
	(f) Worn or corroded needle valve and seat.	(f) Clean and inspect the needle valve and seat. If found to be in questionable condition, replace assembly. Then, test fuel pump pressure. Refer to Specifications for correct fuel pump pressure.
	(g) Worn accelerator pump and throttle linkage.	(g) Disassemble the Carburetor. Replace the worn accelerator pump and throttle linkage and measure for the correct position.
	(h) Automatic choke not operating properly.	(h) Test adjustment and operation of automatic choke. If necessary, replace the choke.
Carburetor Floods or Leaks	(a) Cracked body.	(a) Disassemble the carburetor. Replace the cracked body. Make sure main to throttle body screws are tight.
	(b) Faulty body gaskets.	(b) Disassemble the carburetor. Replace the faulty gaskets and test for leakage. Be sure the screws are tightened securely.
	(c) High float level.	(c) Test the fuel level in the carburetor. Make the necessary adjustment to obtain correct float level.

SERVICE DIAGNOSIS—(Continued)

CARBURETOR

Condition	Possible Cause	Correction
	(d) Worn needle valve and seat.	(d) Clean and inspect the needle valve and seat. If found to be in a questionable condition, replace the complete assembly and test the fuel pump pressure. Refer to Specifications for correct fuel pump pressure.
	(e) Excessive fuel pump pressure.	(e) Test the pump pressure. If the pressure is in excess of recommended pressure (refer to Specifications), replace fuel pump.
Poor Performance—Mixture Too Rich	(a) Restricted air cleaner.	(a) Remove and clean the air cleaner.
	(b) Leaking float.	(b) Disassemble the carburetor. Replace leaking float. Test the float level and correct as necessary, to the proper level.
	(c) High float level.	(c) Adjust the float level as necessary to secure the proper level.
	(d) Excessive fuel pump pressure.	(d) Test the fuel pump pressure. Refer to Specifications for recommended pressure. If pressure is in excess of recommended pressure, replace the fuel pump assembly.
	(e) Worn metering jet.	(e) Disassemble the carburetor. Replace the worn metering jet, using a new jet of the correct size and type.

FUEL PUMP

Fuel Pump Leaks —Fuel	(a) Worn, ruptured or torn diaphragm.	(a) Install a new fuel pump.
	(b) Loose diaphragm mounting plates.	(b) Install a new fuel pump.
	(c) Loose inlet or outlet line fittings.	(c) Tighten the line fittings.
Fuel Pump Leaks —Oil	(a) Cracked or deteriorated pull rod oil seal.	(a) Install a new pump.
	(b) Loose rocker arm pivot pin.	(b) Install a new fuel pump.
	(c) Loose pump mounting bolts.	(c) Tighten the mounting bolts securely.
	(d) Defective pump to block gasket.	(d) Install a new gasket.
Insufficient Fuel Delivery	(a) Vent in tank filler cap restricted. This will also cause collapsed fuel tank.)	(a) Install new cap, and inspect tank for leaks.
	(b) Leaks in fuel line or fittings.	(b) Tighten the line fittings.
	(c) Dirt or restriction in fuel tank.	(c) Install a new fuel filter and clean out the tank.
	(d) Worn, ruptured, or torn diaphragm.	(d) Install a new pump.
	(e) Frozen gas lines.	(e) Thaw the lines and drain the tank.
	(f) Improperly seating valves.	(f) Install a new fuel pump.
	(g) Vapor lock.	(g) Install heat shield where lines or pump are near exhaust.
	(h) Weak main spring.	(h) Install a new fuel pump.
	(i) Incorrect fuel pump.	(i) Install correct fuel pump.
	(j) Restricted fuel filter.	(j) Install a new filter.
Fuel Pump Noise	(a) Loose mounting bolts.	(a) Tighten the mounting bolts.
	(b) Scored or worn rocker arm.	(b) Install a new fuel pump.
	(c) Weak or broken rocker arm spring.	(c) Install a new fuel pump.

GROUP 16
PROPELLER SHAFT AND UNIVERSAL JOINTS

CONTENTS

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Special Tool Usage Chart	1	Cross and Roller Universal Joint	5
Propeller Shaft Angularity	3	Service Diagnosis	6

SPECIFICATIONS

	Plymouth 8 Cyl. (VP-2)	Plymouth 6 Cyl. (VP-1)	Valiant All Models (VV-1)
PROPELLER SHAFT			
Type		Tubular	
Propeller Shaft Angularity		Approximate 2 Degrees	
*Length—Standard Transmission	55.76"	55.76"	53.40"
Automatic Transmission	53.64"	53.64"	53.40"
Diameter—Standard Transmission	3.00"	3.00"	2.75"
Automatic Transmission	2.75"	2.75"	2.75"
Special Equipment	3.00"	—	3.00"
UNIVERSAL JOINTS			
Type—Front		Ball and Trunnion	
Rear		Cross and Roller	

*Front centerline of trunnion pin to centerline of rear yoke bearing bores.

SPECIAL TOOL USAGE CHART
Trunnion Pin Removing and Installing Jig

	Plymouth 8 Cyl.	Plymouth 6 Cyl.	Valiant
Manual Transmission—Standard	C-3313	C-552	C-552
Manual Transmission—225 Cubic Inch Engine	—	—	C-3313
Manual Transmission—Heavy Duty	C-3567	C-552	—
Automatic Transmission—Standard	C-3567	C-3313	C-552
Automatic Transmission—225 Cubic Inch Engine	—	—	C-3313

TORQUE REFERENCE

	Foot-Pounds	Inch-Pounds
Front—Companion Flange Nut	32	
Rear—Clamp Bolts		110
Rebound Bumper Plate Bolts (Valiant)		150
(All other Plymouth Models)		200
Rear Spring U Bolt Nuts (Valiant)	45	
(All other Plymouth Models)	50	

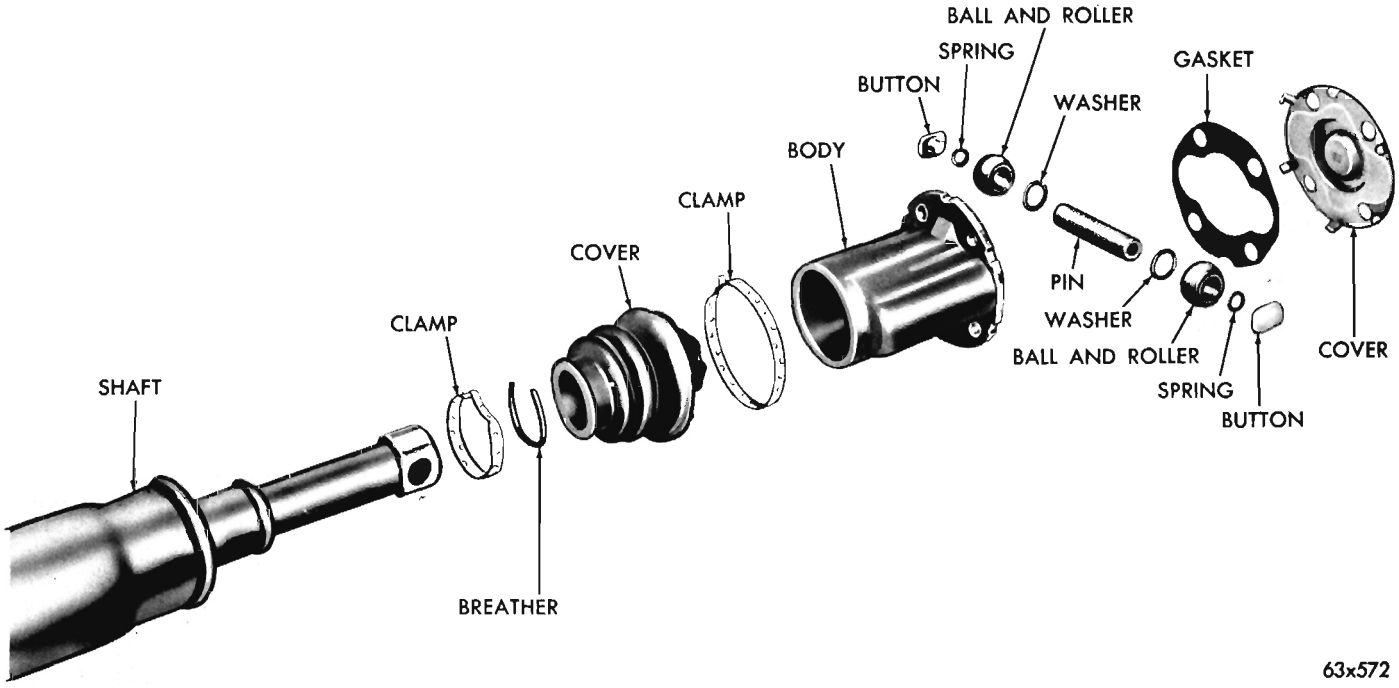


Fig. 1—Ball and Trunnion Universal Joint (Disassembled)

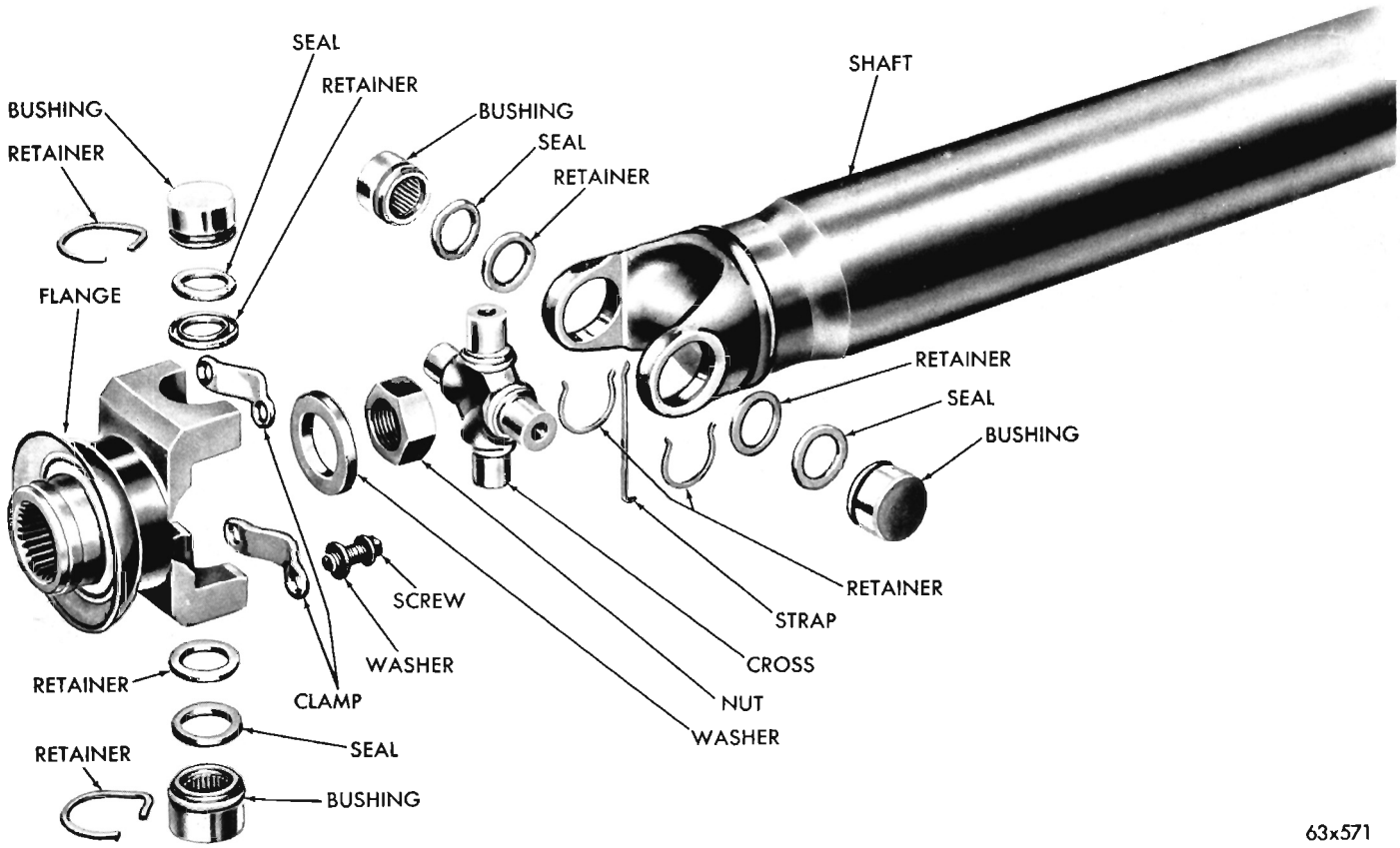


Fig. 2—Cross and Roller Universal Joint (Disassembled)

PROPELLER SHAFT AND UNIVERSAL JOINTS

The propeller shaft has a ball and trunnion type universal joint at its forward end (Fig. 1) and a cross and roller type universal joint at the rear (Fig. 2).

When the vehicle is in motion, the propeller shaft is free to slide fore and aft inside the front universal joint body. All working parts are sealed against road splash, dust, mud and water. The front joint is equipped with a polished jute breather. The breather lengthens the life of the boot by decreasing the flexing action due to variations of air pressure within the assembly as the shaft moves back and forth in the joint body.

The universal joints are permanently lubricated; however, if the joints are disassembled for any reason, they should be inspected and repacked with Mopar Multi-Mileage Lubricant, Part No. 2298947.

SERVICE PROCEDURES

1. PROPELLER SHAFT ANGULARITY

The quiet smooth operation of the propeller shaft and universal joints depends upon proper alignment. The propeller shaft and rear axle housing angles may be measured by using an alignment measuring gauge, Tool J-6485 with the vehicle in a level position and no additional weight, except the fuel tank must be full.

CAUTION: The vehicle must be supported by the wheels, or front suspension lower control arms and rear axle housing. Do not use a frame contact hoist for measuring propeller shaft angularity.

(1) Use a twin post hoist or drive-on hoist, pit, wheel or frame alignment rack. Level the vehicle. Measure the level at underside of the body sill at the center of the front door.

(2) Remove the rebound plate and bumper assembly from the top of the differential carrier housing.

(3) Hold the gauge, Tool J-6485 on the machined surfaces of the rebound plate bosses (Fig. 3). Adjust the gauge to center the bubble in the spirit level.

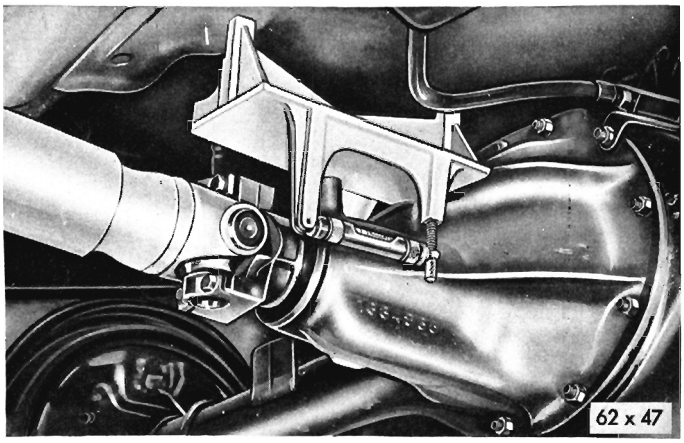


Fig. 3—Measuring the Angle of the Rear Axle Housing

NOTE: Each time the gauge is used, the level must be on the same side of the propeller shaft.

(4) Hold the gauge on the underside of the propeller shaft near the rear universal joint (Fig. 4), and look for the location of the bubble in the spirit level. The entire bubble should be within three graduations from center (Fig. 5 and 6).

(5) If the rear joint angle must be adjusted, tapered shims should be added between the rear springs and differential housing spring plates, as shown in Figure 7.

(6) If the edge of the bubble is forward of the third graduation, the angle of the rear axle housing should be changed. Loosen all "U" bolt nuts and install two-degree tapered wedges between both rear springs and the axle housing pads with the thick end of the wedge toward the front of the vehicle (Fig. 5). Tighten the rear spring "U" bolt nuts to 55 foot-pounds torque.

(7) Re-measure the rear joint angle, then install the rebound bumper and plate assembly on the carrier housing. Tighten the retaining bolts to 200 inch-pounds torque.

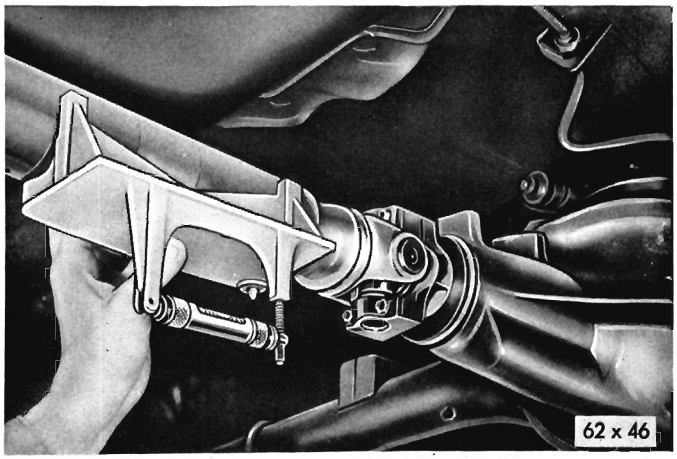
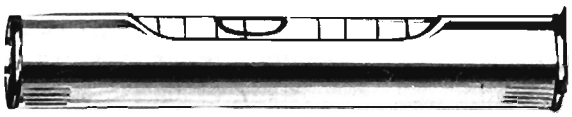


Fig. 4—Measuring the Propeller Shaft Angularity



ADD SHIMS

58x705

Fig. 5—Bubble Location (Forward of Center)

2. PROPELLER SHAFT (Figs. 1 and 2)

Removal

(1) Remove both rear universal roller and bushing assembly clamps from the pinion yoke. (Do not disturb the retaining strap used to hold the roller assemblies on the universal joint cross).

(2) Disconnect the front universal joint from the transmission flange and remove the propeller shaft from the vehicle.

CAUTION: Do not allow the propeller shaft to drop or hang loose on the vehicle from either joint during the removal. Wire up to underbody.

Installation

(1) Attach the front universal joint to the transmission flange. Tighten the attaching nuts to 32 foot-pounds torque.

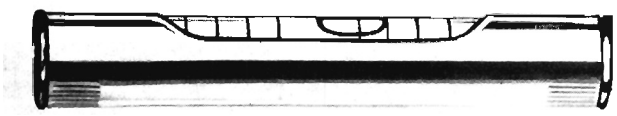
(2) Install the rear universal cross rollers into the seats of the pinion yoke.

(3) Install the roller clamps and attaching bolts. Tighten the attaching bolts to 110 inch-pounds torque.

3. BALL AND TRUNNION UNIVERSAL JOINT

Disassembly

(1) Straighten the tabs and remove the grease cover and gasket (Fig. 1).



SUBTRACT SHIMS

58x706

Fig. 6—Bubble Location (Rear of Center)

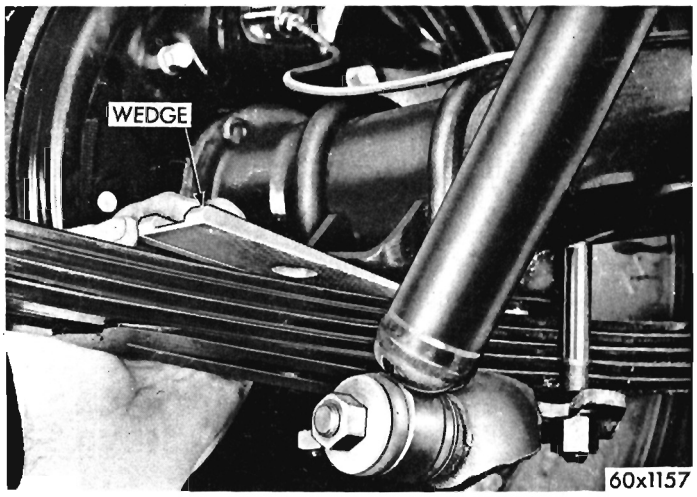


Fig. 7—Installing the Tapered Wedges

(2) Push the body back and remove the parts from both ends of the trunnion pin.

(3) Remove the clamps and loosen the dust cover. Remove and save the breather (polished jute) located between the shaft and rear end of the cover.

(4) Clean and examine the trunnion pin and the raceways in the body for wear. If wear in the body can be felt, it should be replaced. If either part is to be replaced, use the "Special Tool Usage Chart" and a hydraulic press to push the pin out of the shaft.

Cleaning and Inspection

(1) Clean the parts in kerosene, mineral spirits or other suitable solvents. If the pin, body and boot have not been removed, make sure that the body and boot are clean inside as well as outside.

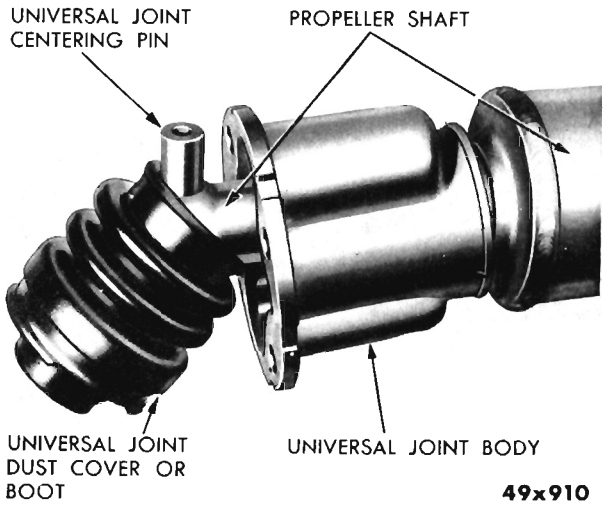


Fig. 8—Sliding Cover Over Ball Head and Pin

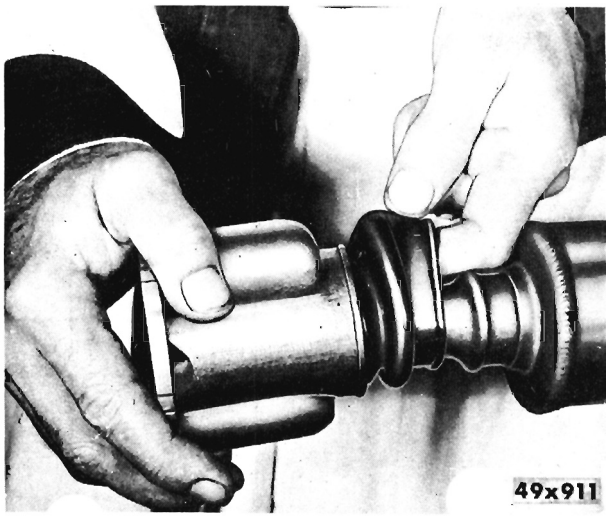


Fig. 9—Working Cover through Body

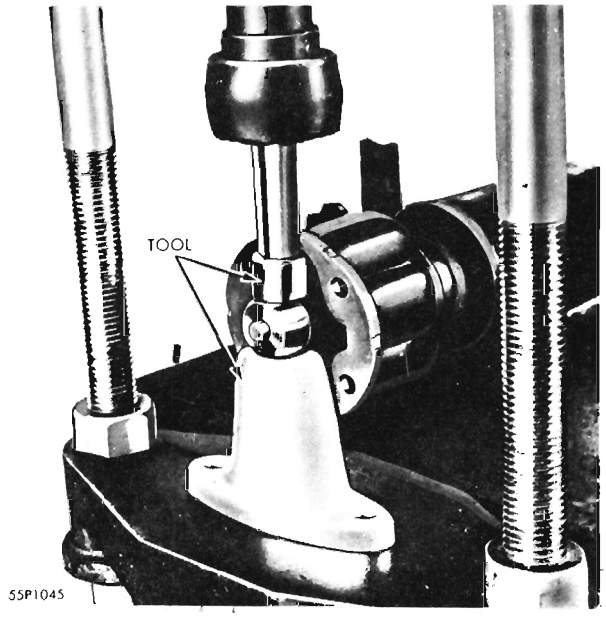


Fig. 10—Installing the Trunnion Pin

Assembly

When the trunnion pin and body have not been removed, a new boot can be installed, after coating all parts with Multi-Mileage lubricant (Figs. 8 and 9). Without using tools, stretch the boot over the pin and work it through the body into position on the shaft.

(1) The trunnion pin must be installed in the propeller shaft by the use of a hydraulic press and the correct tool. The pin is properly centered when press ram contacts the spacer portion of the tool (Fig. 10). Refer to "Special Tool Usage Chart".

(2) Install a thrust washer, rollers, ball, button spring and thrust button on each end of the trunnion pin and position the body over the pin assembly.

(3) Position the boot on the propeller shaft, with the breather (polished jute) parallel to the shaft. Install and tighten the clamp.

(4) Position the boot on the joint body and install the clamp.

(5) Lubricate the universal joint with **two ounces** Multi-Mileage lubricant applied evenly in both raceways, one-half back of the trunnion pin and one-half between the pin and cover. **Two ounces of Multi-Mileage Lubricant would be about ½ inch deep if placed on the universal joint grease cover. Do not use more than the specified amount. Do not place grease inside the boot.**

(6) Install the gasket on the cover, and position the cover on the body with tabs at grooves in the body. Bend the tabs to tighten cover in place.

4. CROSS AND ROLLER UNIVERSAL JOINT

Disassembly

(1) Remove the retainer and press one roller and bushing assembly out of the yoke by pressing the opposite bushing in (Fig. 2).

(2) Press the remaining roller and bushing assembly out by pressing on the end of the cross assembly.

(3) Remove the cross from the yoke. The cross and seal retainers are serviced as an assembly. Do not remove seal retainers from the cross.

Cleaning and Inspection

(1) Clean the parts in kerosene, mineral spirits or other suitable solvents and dry with compressed air.

(2) Examine the bearing surfaces of the cross. The surfaces should be smooth, free from pits and ripples. If the dust seal retainers are damaged, replace the cross assembly.

(3) Examine the roller bearings in the bushings. Bearings that have operated on a worn cross should be replaced. Bearings should have a uniform appearance and should roll freely inside the bushings.

Assembly

(1) Force Multi-Mileage lubricant between the rollers in all four bushings. Fill the reservoirs in the ends of the cross.

(2) Place the cross in the propeller shaft yoke and insert the roller bushing assemblies in the yoke.

(3) Press the roller and bushing assemblies into the yoke while guiding the cross into both bushings.

(4) Press until both bushing retainers can be installed in the grooves in the bushings.

(5) Position the remaining two bushings on the cross and install the retainer strap to hold the bushings on the cross during installation in the vehicle.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
Propeller Shaft Vibration	(a) Excessive grease in the universal joint dust boot.	(a) Remove all grease and pack a total 2 ounces of Multi-Milage Lubricant. Part No. 2298947 evenly fore and aft of the trunnion' pin in both raceways.
	(b) Undercoating or other foreign material on shaft.	(b) Clean propeller shaft and wash with solvent.
	(c) Loose universal joint flange bolts.	(c) Tighten the flange bolts.
	(d) Loose or bent universal joint flange.	(d) Install a new flange if worn or bent and tighten to specifications.
	(e) Improper drive line angularity.	(e) Correct the propeller shaft angularity.
	(f) Rear suspension spring center bolt not in seat.	(f) Loosen the spring clamps and reset the spring center bolt.
	(g) Worn trunnion pin.	(g) Recondition the universal joint. Install a new trunnion pin.
	(h) Trunnion pin not centered.	(h) Center trunnion pin correctly or replace, using Special Tool.
	(i) Worn universal joint bearings or missing needle bearings.	(i) Recondition the universal joint.
	(j) Worn universal joint housing.	(j) Recondition the universal joint. Install a new housing.
	(k) Propeller shaft damaged (bent tube) or out of balance.	(k) Install a new propeller shaft.
Universal Joint Noise	(a) Propeller shaft flange nuts loose.	(a) Tighten to specified torque.
	(b) Lack of lubrication.	(b) Inspect and replace worn parts and lubricate with 2 ounces of Multi-Milage. Lubricant, Part No. 2298947.
	(c) Worn universal joint pin or housing.	(c) Replace worn parts.

GROUP 17

SPRINGS AND SHOCK ABSORBERS

CONTENTS

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Measuring Rear Spring Height	4	Rear Shock Absorbers Replacement	7
Rear Springs	4	Testing the Shock Absorber	7
Rear Spring Front Pivot Bushing Replacement	4	Service Diagnosis	7

SPECIFICATIONS

	Plymouth VP-1, VP-2	Valiant VV-1
REAR SPRINGS		
Type	Semi-Elliptic	
Number of Leaves		
Sedan		
(Standard)	5	4
(Heavy Duty)*	5½	5
Station Wagon		
(Standard)	6½	5
(Heavy Duty)*	6½	6
Length (inches)	56	55
Width (inches)	2½	2½
Spring Mounting		
Front	Pivot, Rubber Bushed	
Center	"U" Bolts and Plate	
Rear	Shackle, Rubber Bushed	
SHOCK ABSORBERS		
Type	Oriflow	
Mounting	Rubber Bushing	

*Zinc Interleaves used between all leaves.

TOOL LIST

C-3553 ..... Front Shock Absorber Lower Bushing Remover and Installer
C-3729 ..... Rear Spring Pivot Bushing Remover and Installer

TORQUE REFERENCE

	Foot-Pounds
Front Pivot Nut—Plymouth	125
Valiant	60
Shackle Bolt Nut—Plymouth	30
Valiant	40
"U" Bolt Nut (Plymouth)	45
(Valiant)	40
Front Spring Hanger to Body Bolt	30
Rear Spring Hanger to Body Bolt	30
Front Shock Absorber Mounting Nuts	
Upper	25
Lower	55
Rear Shock Absorber Mounting Nuts	
Upper (Plymouth)	70
(Valiant)	50
Lower	50
Rear Shock Absorber Upper Stud to Body Nut (Valiant)	50

REAR SPRINGS AND SHOCK ABSORBERS

The rear springs (Figs. 1 and 2) are of the semi-elliptic type with rubber bushings in the "eye" of each end of the main leaf.

The front ends of the springs are attached to mounting brackets bolted to the body. The rear ends of the springs are attached to the body by flat plate shackles (except Plymouth Station Wagons, which are equipped with offset plates) with rubber shackle bushings. The springs are attached to the rear axle housing spring seats by "U" bolts.

Zinc Interleaves — Zinc Interleaves are used between the spring leaves for heavy duty suspension equipped vehicles to help increase spring life. Zinc interleaves are flat pieces of zinc or metal to help cushion the spring leaves. They are used between each leaf for heavy duty suspension.

Double acting "Oriflow" shock absorbers are used with rubber mounting bushings at each end of the shock absorber.

Shock absorbers should only be replaced when they have lost their resistance in one or both directions, if the DRIP or if they have been damaged. **EVIDENCE OF OIL MOISTURE IS NOT CAUSE TO REPLACE THEM.**

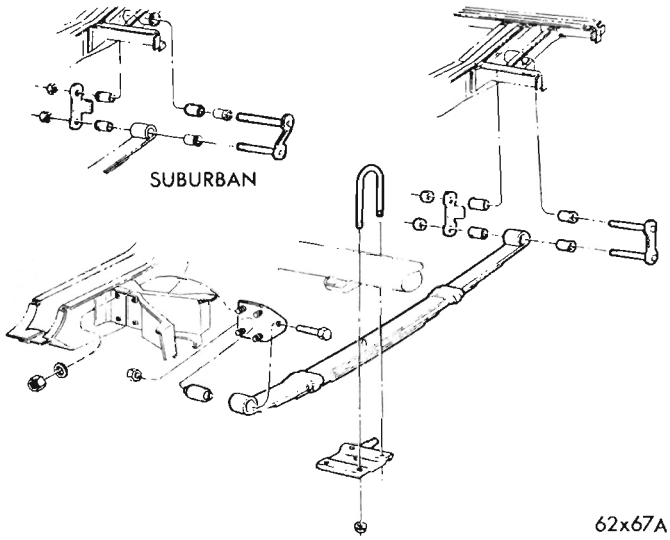


Fig. 1—Rear Springs—Hangers and Shackles (Plymouth)

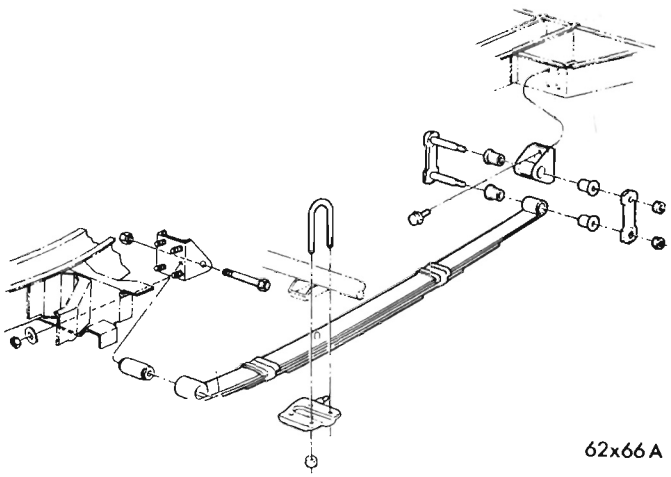


Fig. 2—Rear Springs—Hangers and Shackles (Valiant)

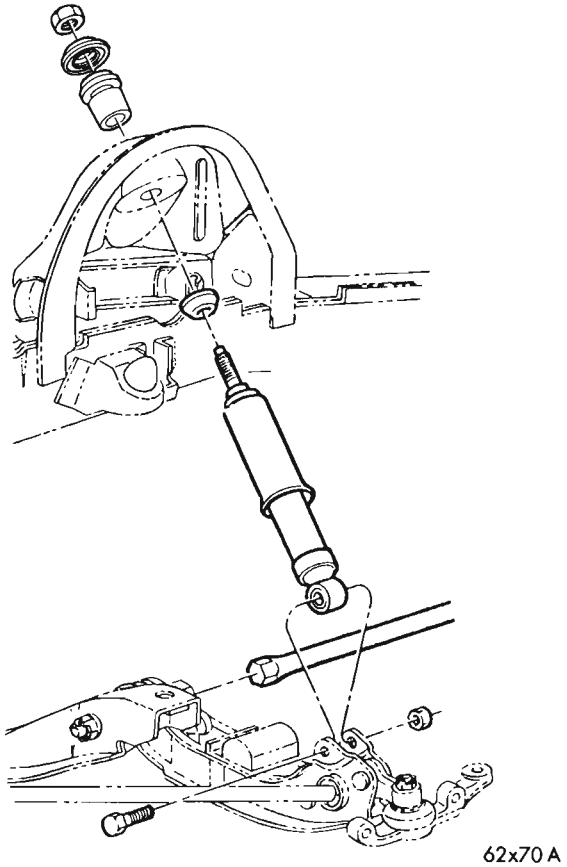


Fig. 3—Front Shock Absorbers (Plymouth)

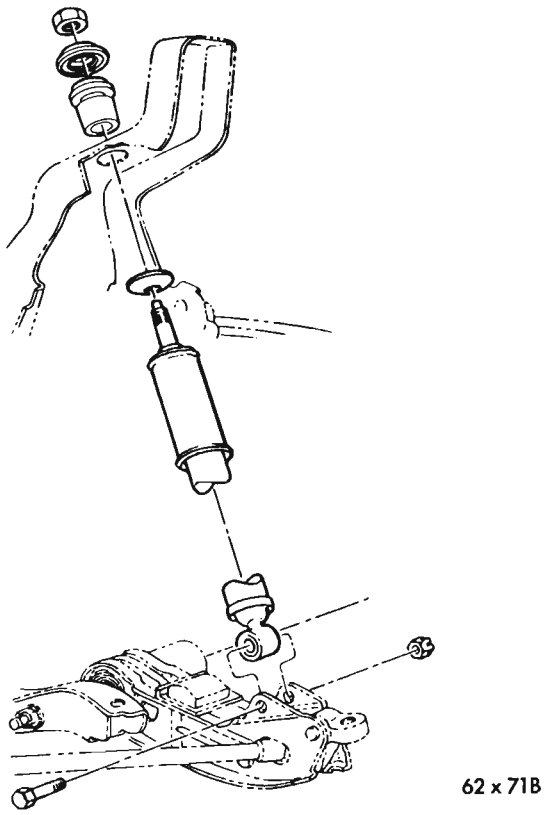


Fig. 4—Front Shock Absorbers (Valiant)

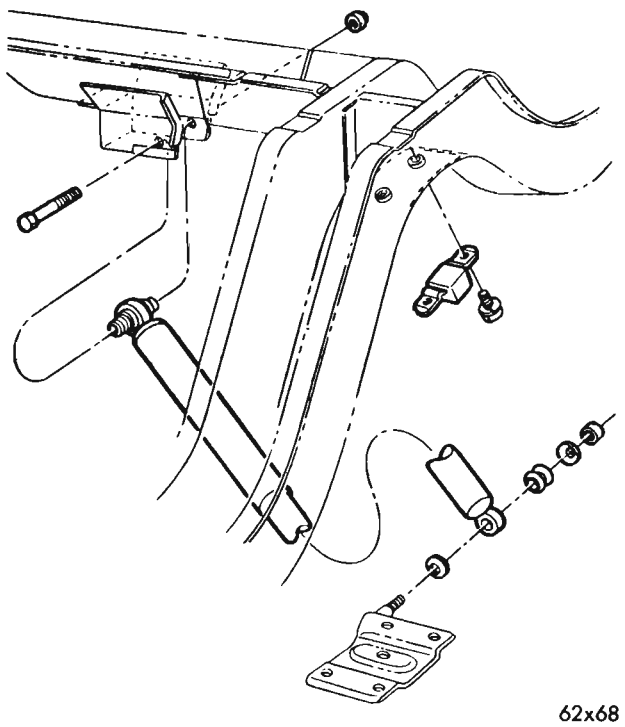


Fig. 5—Rear Shock Absorbers (Plymouth)

The lower ends of the front shock absorber (Figs. 3 and 4) are attached to the lower control arm by means of holes in the side plates of the lower control arm. The top of the shock absorber extends through a bracket and fender shield and is disconnected through the engine compartment.

The rear shock absorbers (Fig. 5 and 6) are mounted with the lower end mounted to a stud, welded to the rear spring plate. The upper end of the shock absorber is attached to a mounting stud, bolted to the body over the rear axle housing on Valiant Models and to a bracket welded to the body on Plymouth Models.

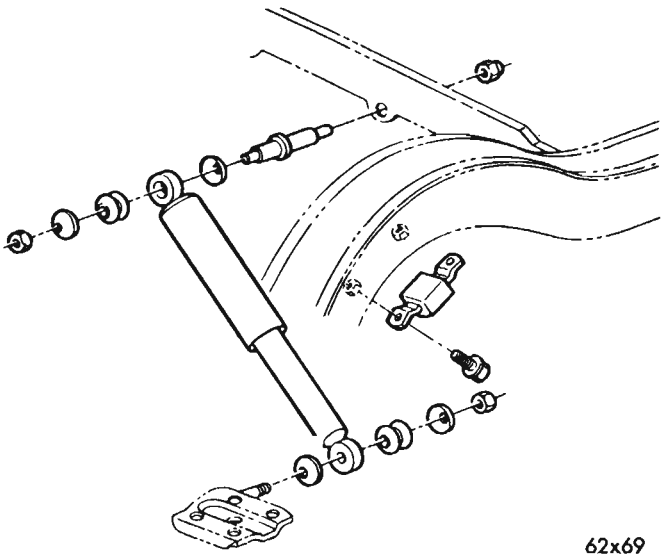


Fig. 6—Rear Shock Absorbers (Valiant)

REAR SPRING

SERVICE PROCEDURES

1. MEASURING REAR SPRING HEIGHT

(1) Jounce the vehicle several times (front bumper first). Release the bumpers at the same point in each cycle.

(2) Measure the shortest distance from the highest point on the underside of the rear axle bumper strap (at rear of bumper) to the top of the axle housing.

(3) Measure both right and left sides.

If these measurements vary by more than ¾ inch (from side to side) it is an indication that one of the rear springs may need replacing. **It is normal for rear springs to show some reverse arch, even with no load, so appearance alone should not be the reason for spring replacement.**

2. REAR SPRING

Removal

(1) Raise the vehicle to a comfortable working level.

(2) Disconnect the rear shock absorber at the lower mounting stud.

(3) Support the vehicle at the lifting points, permitting the rear springs to hang free.

(4) Support the rear axle housing to this position.

(5) Remove the nuts attaching the rear spring front pivot hanger to the body frame.

(6) Remove the "U" bolt nuts and spring plate.

(7) Remove the rear hanger bolts and remove the spring from the vehicle.

(8) Remove the rear spring front pivot bolt and remove the hanger from the spring.

(9) Remove the rear shackle and bushings from the spring and hanger.

Installation

Inspect the rear spring front pivot bolt bushing and if necessary replace the bushing using Tool C-3729 as outlined in Paragraph 3.

(1) Attach the front hanger to the front end of spring and start the pivot bolt nut. **Do not tighten.**

(2) Assemble the rear shackle and bushings (Figs. 1 and 2) in the spring rear eye and the rear spring hanger. **(Do not lubricate the rubber bushings.)** Start the shackle bolt nuts. **Do not tighten.**

(3) Attach the rear spring rear hanger to the body bracket and tighten the bolts to 30 foot-pounds torque.

(4) Attach the rear spring front hanger to the body bracket and tighten the nuts to 30 foot-pounds torque.

(5) Remove the rear axle housing support and place the center hole of the axle spring seat over the head of the spring center bolt.

(6) Place the spring plate under the spring and install the "U" bolts and tighten the nuts to 45 foot-pounds torque for Valiant and 50 foot-pounds for Plymouth Models.

(7) Raise the vehicle and connect the rear shock absorbers. Remove the stands and lower the vehicle onto its wheels.

(8) Jounce the vehicle several times (front bumper first) and compare the spring heights. (It may be necessary to replace the mating spring to insure the position of the vehicle.)

(9) Tighten the front eye bolts and/or nuts to 125 foot-pounds (Plymouth) 60 foot-pounds (Valiant) and the shackle nuts to 40 foot-pounds torque (Plymouth) 30 foot-pounds torque (Valiant) with the full weight of the vehicle on the wheels.

3. REAR SPRING FRONT PIVOT BUSHING REPLACEMENT

The spring front pivot and rear shackle bushings may be replaced with the spring still on the vehicle by the following method:

(1) Raise the vehicle so the spring is relaxed with the rear wheels just touching the floor. **Do not permit weight of rear axle to be suspended on fully extended shock absorbers.**

(2) To replace the front bushing, remove the rear spring front hanger from the body bracket. Remove the pivot and hanger from the spring.

(3) Place the new bushing on Tool C-3729, as shown in Figure 7. Arrange tool on spring eye, then press out the old bushing while pressing the new bushing in the one operation.

(4) Assemble the front hanger to the spring, but do not tighten the pivot bolt nut until the full weight of the vehicle is on the wheels.

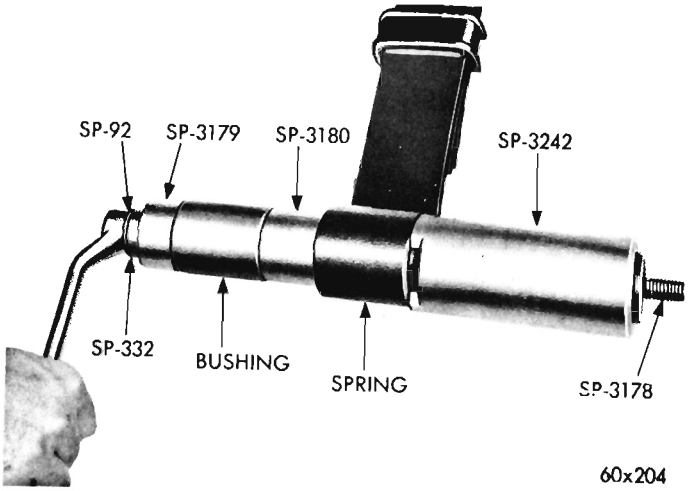


Fig. 7—Removing and Installing Spring Bushing

(5) Attach the spring hanger to the body bracket and tighten the mounting bolts to 30 foot-pounds.

(6) To replace the spring shackle bushing, remove the rear hanger from the body bracket. Remove the shackle, then slide the bushings out of the spring and hanger.

(7) Insert the new bushings in the spring and hanger, then assemble the shackle and hanger on the spring. Start the shackle bolt nuts.

(8) Attach the hanger to the body bracket and tighten the mounting bolt to 30 foot-pounds torque.

(9) With the full weight of the vehicle on the wheels, tighten the rear spring front pivot bolt nut 125 foot-pounds (Plymouth) 60 foot-pounds (Valiant) and the shackle nuts to 40 foot-pounds (Plymouth) 30 foot-pounds (Valiant).

4. LEAF SPRING INTERLINER REPLACEMENT

(1) Release the weight from the rear spring by elevating the body at the closest lifting point of the body.

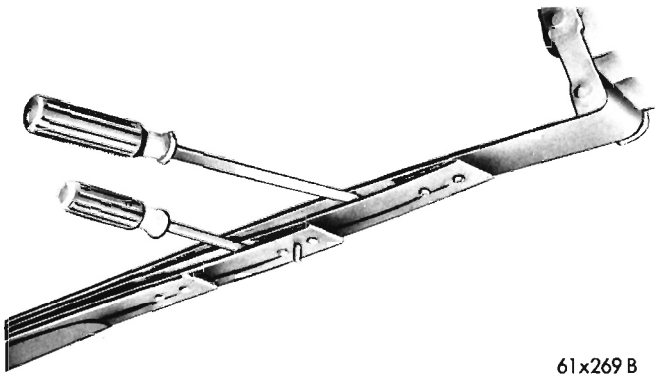


Fig. 8—Separating Spring Leaves

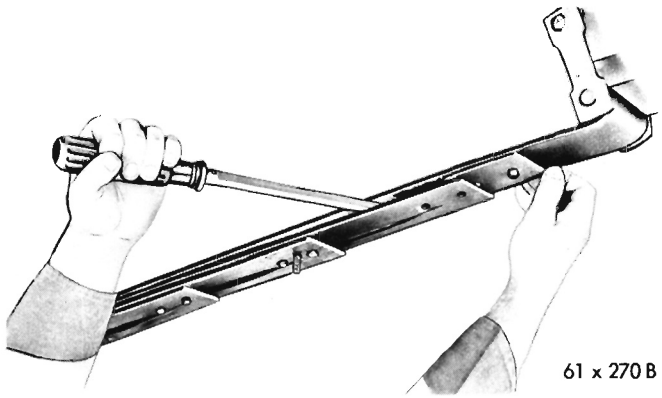


Fig. 9—Positioning Spring Interliner

(2) Remove the nut and washer of the spring alignment clips and remove the clips.

NOTE: On all Valiant models equipped with four leaf springs, discard the alignment clips used after they have been removed from the springs.

(3) Separate the spring leaves (Fig. 8) with a tapered pry bar or screw driver and using another screw driver, remove the interliner from the spring leaf.

(4) Keeping the spring leaves separated, clean the mating area of both spring leaves thoroughly. If any rust or corrosion is evident, wrap sandpaper around a flat file or putty knife and sand until area is smooth and clean.

(5) With the spring leaves still separated, insert the new interliner (Fig. 9) with the retaining buttons in alignment with the locating holes.

(6) Press the retaining buttons into the retainer holes (Fig. 10) and remove the pry bar from the spring leaves.

(7) Repeat the above procedures for the balance of the interliners. **(Do not lubricate the interliners.)**

(8) Reinstall the aligning clips and replace re-

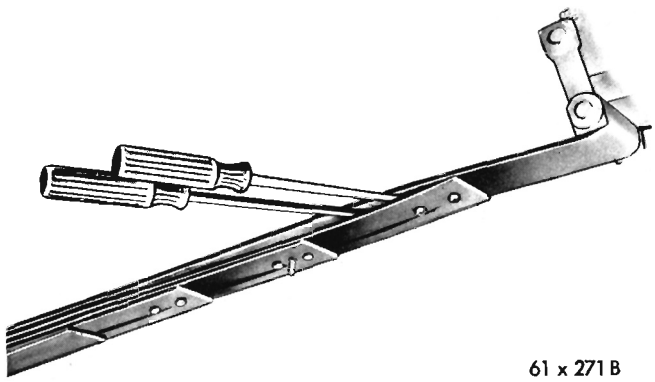


Fig. 10—Installing Interliner Button

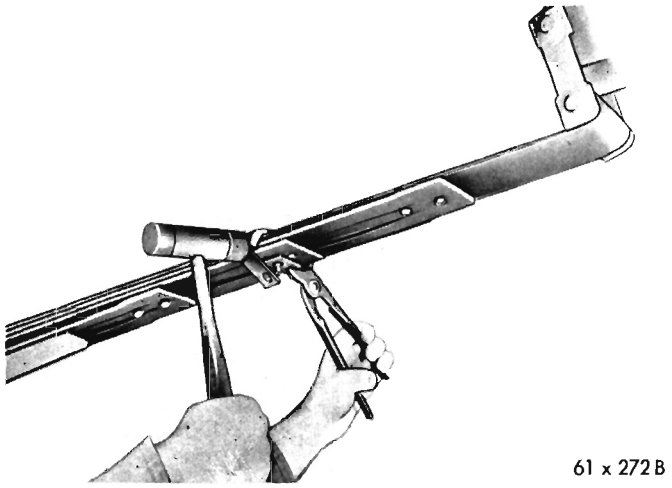


Fig. 11—Installing Alignment Clip

taining nuts and washers, as shown in Figure 11. On Valiant models equipped with the 4 leaf spring, install a new "bolt-on" type clip.

(9) Lower the vehicle onto its wheels.

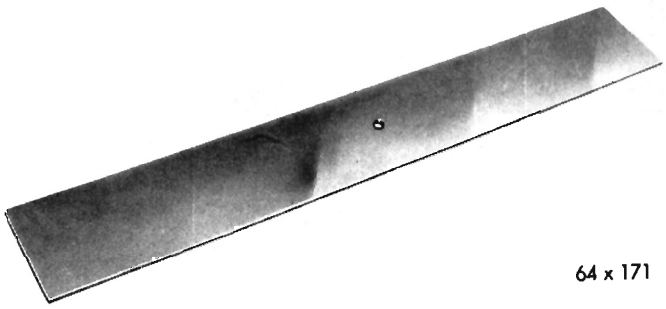


Fig. 12—Zinc Interleaf

5. ZINC INTERLEAF REPLACEMENT (Heavy Duty Suspension)

(1) Remove the rear spring (See Paragraph 2).

(2) Remove the center bolt from the spring and separate the leaves.

(3) Install the zinc interleaves between the spring leaves and install the centerbolt.

(4) Tighten the center bolt.

SHOCK ABSORBERS

6. FRONT SHOCK ABSORBERS

Removal

(1) Remove the nut and washer from the upper end of the piston rod. (Accessible from engine compartment.)

(2) Raise the vehicle and remove the pivot bolt and nut from the lower shock absorber eye and mounting bracket.

(3) Compress the shock absorber and remove it from the vehicle by pulling down out of the upper shock absorber mounting bushing.

(4) If the upper bushing appears worn, damaged, or deteriorated, remove it by first pressing out the inner sleeve, then prying-out or cutting out the rubber bushing. (This bushing will take some set after it has been in service and should be replaced once it has been removed.)

(5) If the lower bushing is to be replaced, remove it from the shock absorber using Tool C-3553 to press on the outer sleeve of the bushing (Fig. 13). Pressing on the inner sleeve will not remove the outer sleeve from the shock absorber.

NOTE: New shock absorbers are furnished with the lower bushing installed; however, bushings are furnished separately for service installation.

(6) Test the shock absorber as outlined in Paragraph 8.

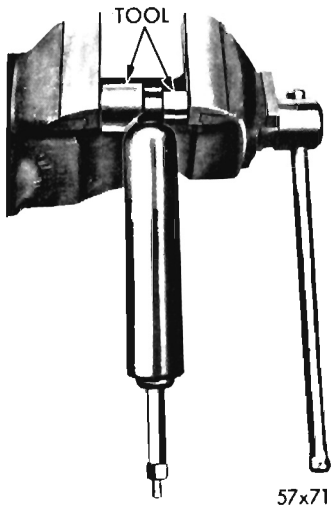


Fig. 13—Installing Shock Absorber Bushing

Installation

(1) With the inner steel sleeve removed from the upper rubber bushing, immerse the bushing in water **(do not use oil or soap)** and with a twisting motion, start the bushing into the hole of the mounting bracket, then tap into place with a hammer. Reinstall the steel sleeve.

(2) Install the lower mounting bushing in the eye of the shock absorber using Tool C-3553 (Fig. 13).

(3) Compress the shock absorber and install the washer on the upper rod of the shock absorber and insert the rod through the upper bushing.

(4) Install the upper compression washer and retaining nut and tighten to 25 foot-pounds torque.

(5) Align the lower mounting bracket and eye of the shock absorber. Install the bolt and nut and tighten to 55 foot-pounds torque with the full weight of the vehicle on the wheels.

7. REAR SHOCK ABSORBER REPLACEMENT

(1) Remove the nuts and washers attaching the shock absorber to its mounting studs.

(2) Remove the shock absorber from the studs.

(3) Remove the remaining cupped washers from the studs.

(4) Inspect the bushings for deterioration or fatigue, and replace if necessary. Test and bleed the shock absorber, as outlined in Paragraph 8.

(5) Position the washers on the shock absorber mounting studs.

(6) Position the shock absorber on the mounting studs and install the remaining cupped washers and nuts. Tighten the upper and lower stud nuts to 60 foot-pounds torque with the full weight of the vehicle on the wheels.

8. TESTING THE SHOCK ABSORBER

(1) With the shock absorber removed from the vehicle, extend the shock absorber fully in an upright position.

(2) Inspect for evidence of fluid running from the upper end of the reservoir. (Actual leakage will be a stream of fluid running down the side and dripping off the lower end of the unit. A slight amount of seepage is not unusual and does not affect performance.)

(3) To test for low fluid level to trapped air in the cylinder, hold the shock absorber in a vertical position and alternately extend and compress the unit. There should be no lost motion in either direction.

(4) Should lost motion be evident, hold the shock absorber in its normal vertical position and fully extend it.

(5) Invert the unit and compress it. **Do not extend the unit while inverted.**

(6) Repeat steps 4 and 5 several times to expel any air trapped in the cylinder.

(7) Should lost motion persist, replace the shock absorber. Repeat operation 4 and 5 prior to installation of a new shock absorber. New shock absorbers may have a greater resistance than an old one due to friction of the new seal.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
Spring Sags or Bottoms	(a) Springs sagged or taken a set.	(a) Replace the spring.
	(b) Broken, bent or weak spring leaves.	(b) Replace the spring main leaf, or spring as necessary.
Spring Noise	(a) Loose "U" bolts.	(a) Tighten the "U" bolt nut 50 foot-pounds torque (Plymouth 45 foot-pounds torque (Valiant).
	(b) Loose or worn shackle bushings.	(b) Replace the bushings and tighten shackle bolt nuts 40 foot-pounds (Plymouth) 30 foot-pounds (Valiant).
	(c) Worn or missing interliners.	(c) Install new interliners.
Spring Breakage	(a) Loose "U" bolts.	(a) Tighten the "U" bolt nuts 50 foot-pounds (Plymouth), 40 foot-pounds (Valiant).
	(b) Shock absorber inoperative.	(b) Replace the spring and the shock absorber.

GROUP 19

STEERING (MANUAL, POWER, PUMPS AND LINKAGE)

CONTENTS

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SPECIFICATIONS

MANUAL STEERING

Type	Recirculating Ball Nut
Ratio	24 to 1
Cross Shaft Bearings (Plymouth)	3-Needle Bearings
Cross Shaft Bearings (Valiant)	3-Bronze Bushings
Worm Shaft Bearings	2-Caged Ball Bearings
Cross Shaft Adjusting Screw End Play	.000-.004 Inch
Worm Bearing Pre-Load (in car)	1½ to 4½ in. lbs. to Keep Wheel Moving
Worm Bearing Pre-Load (out of car)	1½ to 4½ in. lbs. to Keep Wheel Moving
Sector Mesh Adjustment Pre-Load Torque—Includes worm bearing Pre-Load (in car)	8¼ to 11¼ in. lbs. Pull through high spot
Sector Mesh Adjustment Pre-Load Torque—Includes worm bearing Pre-Load (out of car)	7⅞ to 11¼ in. lbs. Pull through high spot

STEERING COLUMN

Column Bearing	1 Ball Bearing
Wheel Turns—Steering Arm Removed	5¾
Wheel Turns—Steering Arm and Linkage Attached	5⅜ Approx.
Steering Shaft to Wormshaft Coupling	Sealed U-Joint Type

POWER STEERING GEAR

Ratio	15.7 to 1
Gear Shaft Bearings	3 Needle Bearings
Worm Shaft Thrust Bearing Pre-Load	16-24 Inch Ounces
Fluid Capacity of Steering Hydraulic System	2½ Pints
Type of Fluid	Use Only Part No. 2084329 Power Steering Fluid

POWER STEERING PUMP

Maximum Pump Pressure .96 Displacement Pump (Valiant)	650 to 750 psi Maximum
.96 Displacement Pump (Plymouth)	850 to 950 psi Maximum
Maximum Fluid Flow at 3000 rpm	2¼ Gal. per minute

SPECIAL TOOLS

Tool Number	Tool Name
C-760	Pliers—Snap Ring
C-3128	Pliers—Snap Ring
C-3211	Hose—High Pressure
C-3229	Pliers—Snap Ring
C-3309B	Gauge—Pressure Check
C-3318	Hose—Low Pressure
C-3323	Fixture—Steering Gear Holding
C-3388	Hose—Coupling
C-3428A	Puller—Steering Wheel
C-3633	Nut Wrench—Gear Shaft Retaining
C-3634	Nut Wrench—Power Train Retaining
C-3637	Nut (Splined)—Worm Shaft Turning
C-3638	Remover—Gear Worm Shaft Seal
C-3640	Driver—Pump Shaft Seal
C-3642	Remover—Pump Shaft Seal
C-3643	Stand—Pump Shaft Supporting
C-3646	Puller—Steering Arm (Replaces C-3402)
C-3649	Tool—Spacer to Housing Aligning
C-3650	Driver—Gear Worm Shaft Seal
C-3676	Remover and Installer—Power Train Piston Ring
C-3875	Remover, Adapter, Installer and Arbor—Gearshaft Needle Bearings
C-3879	Installer—Steering Column Shaft Bearing
C-3880	Remover and Installer—Gear Shaft Oil Seal
C-3885A	Remover and Installer—Gear Shaft Oil Seal
C-3885A	Gauge—Power Steering Pump Flow Test
C-3891	Puller—Steering Column Shaft Bearing
C-3894	Puller—Tie Rod, Steering Arm and Idler Arm Ends
C-3929	Arbor—Steering Gear Worm Shaft Bearing
C-3934	Puller—Power Steering Pump Pulley
MTU-36	Ounce Pull Scale

TIGHTENING REFERENCE

	Foot-Pounds
MANUAL STEERING	
Cross Shaft Cover Bolt	25
Steering Arm Nut	120
Gear Assembly to Frame Bolt	50
Steering Wheel Nut	24
Cross Shaft Adjusting Screw Lock Nut	35
POWER STEERING	
Steering Wheel Nut	24
Steering Arm Nut	120
Steering Column Support Nut	110 to 200
Steering Gear Shaft Cover Nut	110 to 200
Steering Gear Shaft Adjusting Screw Lock Nut	50
Pressure Control Valve Body Screws	10-15
Steering Gear Housing to Frame Bolt	50
Steering Valve End Plug	25
Steering Valve Body Attaching Bolts	10-15

PART 1

MANUAL STEERING GEAR

The manual steering gear (Fig. 1) is designed to provide easy steering with a minimum of friction in the steering gear. A ball nut travels up or down on the wormshaft, riding on recirculating balls acting as a screw thread.

The wormshaft and ball nut assembly is supported in the gear housing by an adjustable ball thrust type upper and lower bearing. The lower bearing cup is pressed into the gear housing, and the upper bearing cup is pressed into the wormshaft bearing adjuster.

The cross shaft is integral with the sector gear and the sector gear meshes with the rack teeth on the re-circulating ball nut. Adjustment at this point is controlled by the cross shaft adjusting screw which extends through the housing cover.

SERVICE PROCEDURES

1. ADJUSTMENTS

Two adjustments are provided in the steering gear (Fig. 2). The worm bearing preload adjustment, and the ball nut rack sector gear mesh adjustment.

Before the correct adjustment can be made at the ball nut rack and the sector gear, it must be determined that the worm bearing preload is properly adjusted.

The worm bearing preload adjustment is controlled by the worm thrust bearing adjuster which threads into the housing at the upper end of the wormshaft.

2. TESTING WORM BEARING PRE-LOAD (In Vehicle)

(1) Disconnect the steering gear arm from the sector shaft with Tool C-3646 (Fig. 3).

(2) Remove the horn button or horn ring (if so equipped).

(3) Loosen the cross shaft adjusting screw lock nut, and back out the adjusting screw approximately two turns. This will relieve any friction load which may be present at the closely meshed ball nut rack and sector gear teeth.

(4) Turn the steering wheel two complete turns

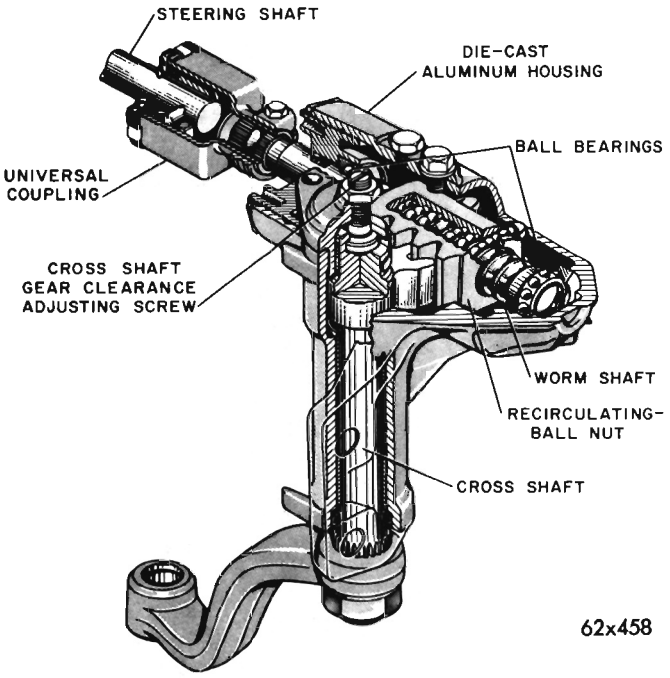


Fig. 1—Steering Gear Cross Section

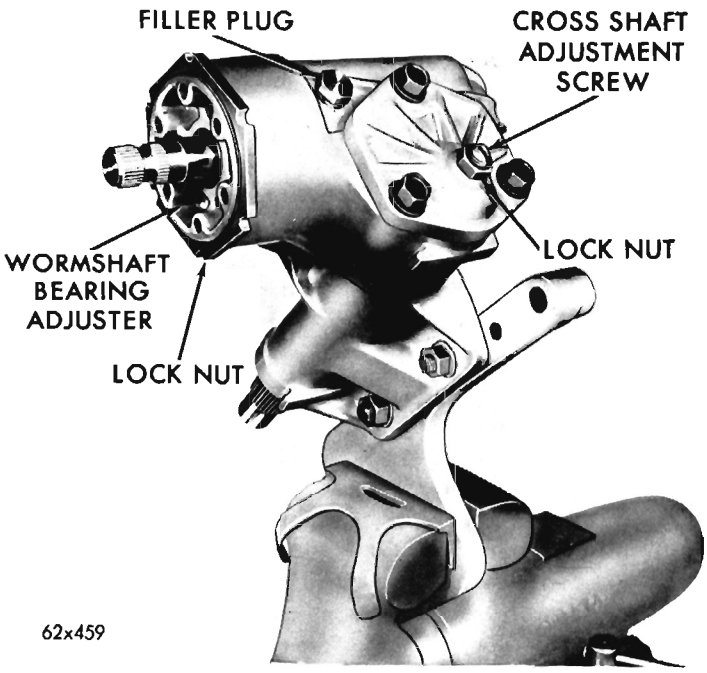


Fig. 2—Steering Gear Adjustment Locations

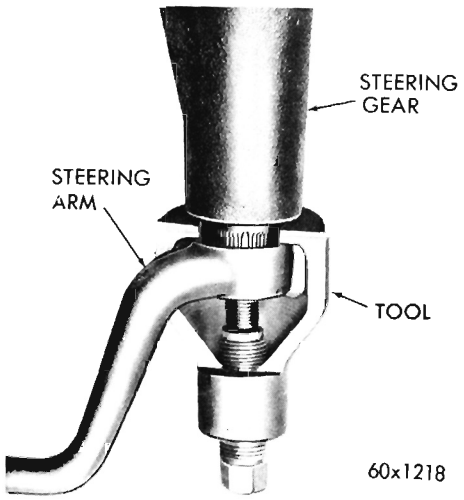


Fig. 3—Removing the Steering Gear Arm (Typical)

from the straight ahead position, and place the torque wrench Tool C-3380 on the steering shaft nut.

(5) Rotate the steering shaft at least one turn toward the straight ahead position, while testing the rotating torque with the torque wrench.

The torque required to keep the wheel moving should be between 1½ and 4½ inch pounds. If the reading is not within these limits, adjustment of the worm bearing preload is necessary.

3. WORM BEARING PRE-LOAD ADJUSTMENT

(1) Loosen the adjuster lock nut.

(2) Use the adjuster wrench from Tool C-3884 set and turn the adjuster-clockwise to increase the preload, or counter-clockwise to decrease the preload.

(3) While holding the adjuster from turning, tighten the lock nut securely, then retest the worm bearing preload.

4. BALL NUT RACK AND SECTOR MESH ADJUSTMENT (In Vehicle)

The cross shaft adjusting screw, located in the housing cover, raises or lowers the shaft to provide the proper mesh load between the tapered teeth of the sector gear and the tapered teeth of the ball nut.

NOTE: This adjustment can be accurately made only after the proper worm bearing preload has been established.

(1) Turn the steering wheel gently from one stop all the way to the other, carefully counting the number of turns. Turn the steering wheel back exactly half way, to the center position.

(2) Turn the cross shaft adjusting screw clockwise to take out all lash between the ball nut rack and sector gear teeth, then tighten the adjusting screw lock nut to 35 foot-pounds torque.

(3) Turn the steering wheel about ¼ turn away from the center or "high spot" position. Then, using torque wrench Tool C-3380, at the steering wheel nut, measure the torque required to rotate the steering wheel through the high spot at the center position. The reading should be between 8¼ and 11¼ inch pounds. This represents the total of the worm shaft bearing preload and the ball nut rack and sector gear mesh load. Readjust the cross shaft adjustment screw if necessary, to obtain the proper torque reading.

(4) After the adjustments have been completed, place the front wheels in a straight ahead position, and with the steering gear and steering wheel centered, install the steering arm on the cross shaft.

(5) Tighten the steering arm retaining nut to 120 foot-pounds torque.

5. STEERING GEAR

Removal

NOTE: The manual steering gear can be removed without removing the steering column assembly.

(1) Remove the steering gear arm retaining nut. Remove the arm with Tool C-3646 (Fig. 3).

(2) Remove the bolt from the coupling clamp at the upper end of the steering gear wormshaft.

(3) To provide sufficient clearance at the coupling, loosen the column jacket to instrument panel clamp bolts (Fig. 4), sufficient to disengage the tab on the clamp from the slot in the column jacket. Slide the column assembly up far enough to disengage the coupling from the wormshaft.

CAUTION: Care is required to avoid scratching the column jacket when sliding it up and down in the clamp assemblies.

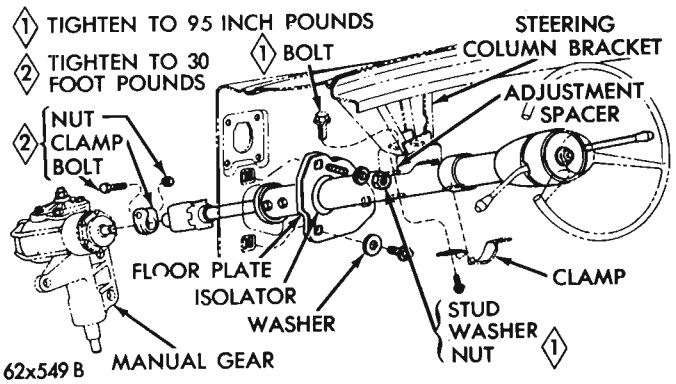


Fig. 4—Steering Column Assembly (Plymouth)

NOTE: It is not necessary to disconnect the shift linkage on Models equipped with manual transmission, or to remove the floor plate to toe board bolts when removing the steering gear. If the floor plate bolts are loosened, it will be necessary to realign the steering column when reinstalling the gear.

(4) Remove the three steering gear housing mounting bolts and remove the steering gear from the vehicle. On Models equipped with six cylinder engines the steering gear can be removed through the engine compartment. On 8 cylinder engines, remove steering gear from underneath the vehicle.

Disassembly

Thoroughly clean the entire outside surface of the steering gear before disassembly to avoid contaminating the wormshaft and ball nut assembly with dirt or grit.

(1) Attach the steering gear to holding fixture, Tool C-3323 and install the holding fixture in a vise (Fig. 2).

(2) Loosen the cross shaft adjusting screw lock nut, and back out the screw about two turns to relieve the load caused by close mesh between the ball nut rack and sector gear teeth.

NOTE: Remove the cross shaft seal as outlined in "Cross Shaft Oil Seal Replacement".

(3) Position the steering wormshaft in the straight-ahead position.

(4) Remove the bolts from the cross shaft cover, then slowly remove the cross shaft while sliding the arbor Tool C-3875 into the housing (Fig. 5).

NOTE: The arbor tool is not necessary on Valiant Models.

(5) Remove the lock nut from the cross shaft adjusting screw and remove the screw from the cover by turning the screw clockwise.

(6) Slide the adjustment screw and shim out of the slot in the end of the cross shaft.

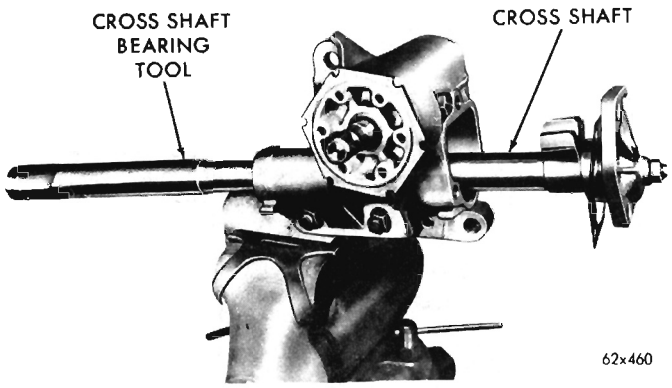


Fig. 5—Removing the Cross Shaft

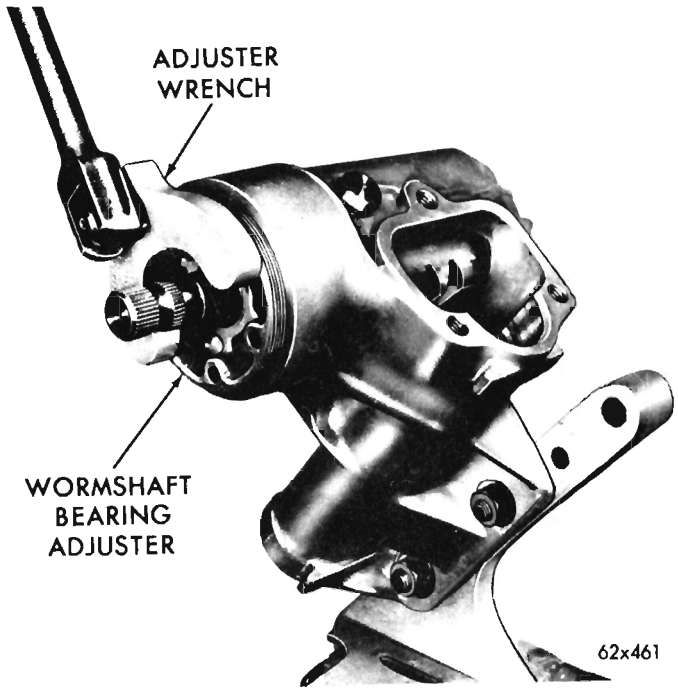


Fig. 6—Removing the Worm Shaft Adjuster

(7) Loosen the wormshaft bearing adjuster lock nut with a soft drift and remove the lock nut. Hold the wormshaft from turning while unscrewing the adjuster, using tool wrench from Tool Set C-3884. (Fig. 6).

(8) Slide the worm shaft adjuster off the shaft.

NOTE: The adjuster must be handled carefully to avoid damage to the aluminum threads.

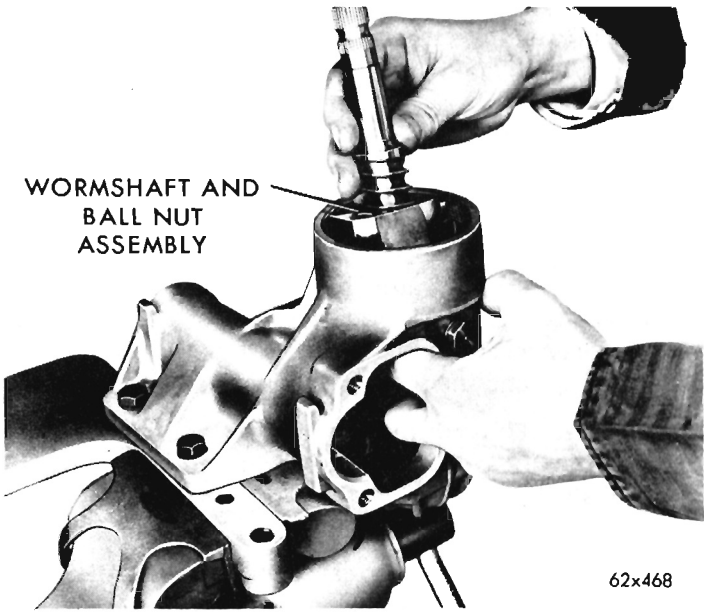


Fig. 7—Removing the Worm Shaft and Ball Nut Assembly

CAUTION: Be careful that the ball nut does not run down to either end of the wormshaft as the ball guide ends can be damaged if the ball nut is allowed to rotate until stopped at the end of the worm.

(9) Carefully remove the worm and ball nut assembly (Fig. 7).

The ball nut and wormshaft are serviced as an assembly only, and are not to be disassembled. Do not remove or disturb the ball return guides.

NOTE: Place the ball nut and wormshaft assembly in a clean place, and cover it to keep it clean.

(10) Remove the cross shaft needle bearing (if so equipped) by placing the steering gear housing in an arbor press; insert Tool C-3875 with adapter ring in lower end of housing (Fig. 8) and press both bearings through the housing.

CAUTION. The adapter ring must be used with remover and installer arbor, Tool C-3875 otherwise the bearings will be crushed.

NOTE: Housings equipped with cross shaft bushings are serviced in assembly only.

NOTE: The cross shaft cover assembly, including a needle bearing or bushing, is serviced as an assembly.

(11) Remove the wormshaft oil seal from the wormshaft bearing adjuster, by inserting a blunt punch behind the seal and tap alternately on each side of the seal until the seal is driven out of the adjuster.

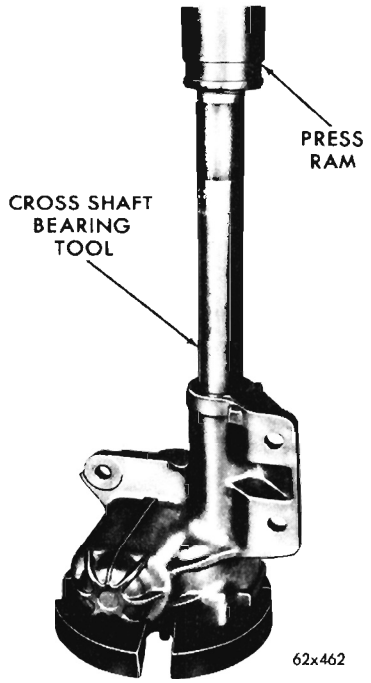


Fig. 8—Removing the Cross Shaft Inner and Outer Bearings

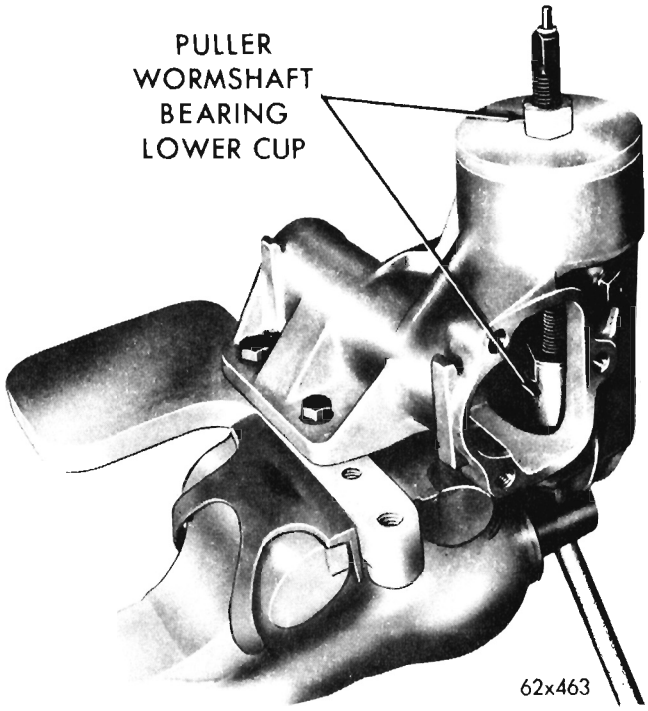


Fig. 9—Removing the Lower Bearing Cup

(12) Remove the wormshaft upper bearing cup in the same manner. However, this must be done carefully to avoid cocking the bearing cup and distorting the adjuster counterbore.

(13) Remove the lower cup if replacement is necessary by positioning the locking puller head jaws of puller Tool C-3868 (Fig. 9) behind the bearing cup and expanding the puller head by pressing down on the center plunger of tool. Withdraw the bearing cup by turning the puller screw nut in a clockwise direction while holding the center screw.

Cleaning and Inspection

Wash all parts in clean solvent and blow dry with compressed air.

Test the operation of the ball nut assembly on the wormshaft. If the ball nut does not travel smoothly and freely on the wormshaft and there is roughness or binding, the assembly must be replaced.

Extreme care is necessary when handling the aluminum worm bearing adjuster to avoid damaging the threads. It is equally important to avoid damaging the mating threads in the gear housing. The wormshaft adjuster must **Never** be screwed into the housing without lubrication, or when threads are dirty or damaged. These precautions **must** be taken to avoid "picking up" the threads and ruining the housing and/or the wormshaft bearing adjuster.

Inspect the cross shaft for wear and check fit of the shaft in the housing bearings. Inspect the fit of the shaft pilot in its housing bearing in the cover.

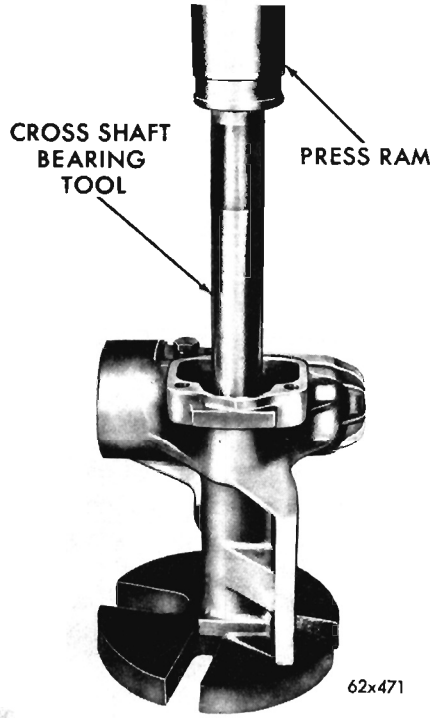


Fig. 10—Pressing the Inner Bearing into the Housing

Make sure the wormshaft has not been bent or otherwise damaged.

The cross shaft and wormshaft oil seals should be replaced when the unit is reconditioned.

Assembly

(1) Install the cross shaft outer needle bearing by placing the bearing on end of Tool C-3875 with the adapter ring. Press the bearing into the housing to $\frac{5}{16}$ inch below the end of the bore to provide space for the oil seal.

CAUTION: The adapter ring must be used with remover and installer arbor Tool C-3875, otherwise the bearings will be crushed.

(2) Install the inner needle bearing by placing bearing on Tool C-3875 with the adapter ring (Fig. 10). Press the bearing into the inside end of the housing bore flush with the inside end of the bore surface.

(3) Install the wormshaft bearing cups, position the cups in the housing and bearing adjuster nut. Then press them in place with Tool C-3865 (Figs. 11 and 12).

(4) Install the wormshaft oil seal by positioning the seal in the wormshaft adjuster with the lip of seal up. Drive the seal into place with a suitable sleeve so it is slightly below the end of the bore in the adjuster.

(5) Apply a coating of steering gear lubricant to all moving parts during assembly, also place lubricant on and around oil seal lips.

(6) Clamp the holding fixture and housing in a vise with the bearing adjuster opening upward.

(7) Place a thrust bearing in the lower cup in the housing.

(8) Hold the ball nut from turning (Fig. 7), and insert the wormshaft and ball nut assembly into the

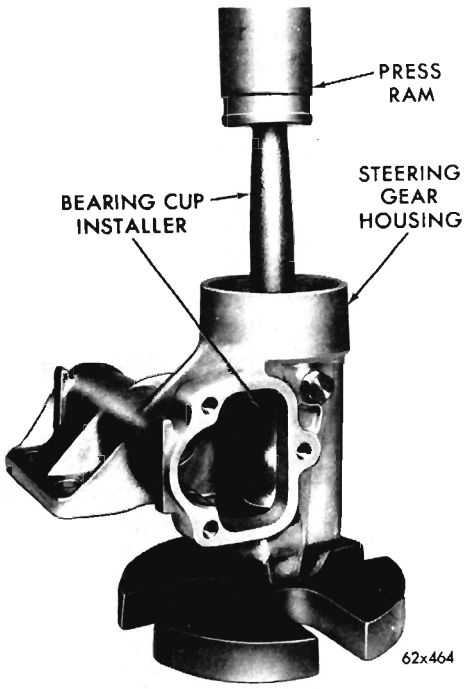


Fig. 11—Installing the Worm Shaft Lower Bearing Cup

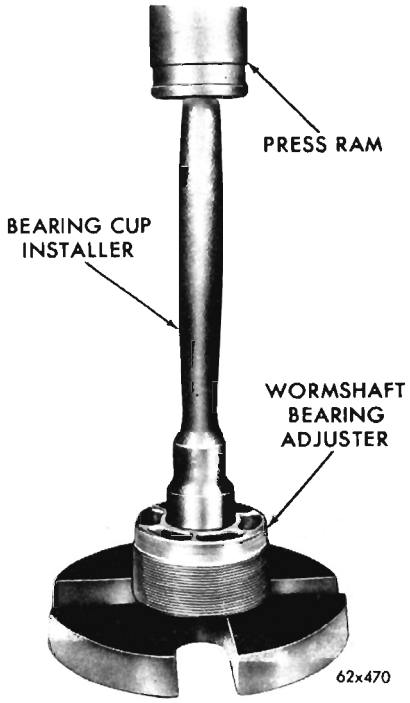


Fig. 12—Installing the Worm Shaft Upper Bearing Cup

housing with the end of the worm resting in the thrust bearing.

(9) Place the upper thrust bearing on the wormshaft.

Thoroughly lubricate the threads on the adjuster and the threads on the housing.

(10) Place a protective sleeve of plastic tape over the wormshaft splines so that the splines do not damage the seal and slide the adjuster assembly over the shaft.

(11) Thread the adjuster into the steering housing, and with Tool wrench C-3884 and splined nut set, tighten the adjuster to 50 foot pounds while rotating the wormshaft. This is done to effectively seat the bearings.

(12) Loosen the adjuster so no bearing preload exists. Then, using torque wrench Tool C-3380, adjust the wormshaft bearing preload from 1⅛ to 4½ inch pounds.

(13) After adjusting the preload, tighten the bearing adjuster lock nut, and then retest to be sure the preload remains between 1⅛ and 4½ inch pounds.

(14) Before installing the cross shaft, pack the worm shaft cavities in the housing above and below the ball nut with steering gear lubricant. Use steering gear lubricant whenever possible, but if not available, a good grade of multi-purpose lubricant may be used. Do not use gear oil. When the gear is properly packed with steering gear lubricant it will contain eleven fluid ounces of lubricant, and the level of the lubricant will be at the top of the worm.

(15) Slide the cross shaft adjusting screw and shim into the slot in the end of the shaft.

(16) Test the end clearance shown in Figure 13. The screw must be free to turn with no perceptible end play to .004 inch loose. Three different thickness shims are available to obtain the specified clearance.

(17) Start the cross shaft and adjuster screw into bearing in the housing cover. Then, using a screw driver through the hole in the cover, turn the screw counter-clockwise to pull the shaft into the cover.

(18) Install the adjusting screw lock nut, but do not tighten at this time.

(19) Rotate the wormshaft to centralize the ball nut.

(20) Place a new cover gasket on the housing cover.

(21) Carefully install the cross shaft and cover assembly into the steering gear housing (Fig. 5).

NOTE: The cross shaft and sector teeth should be coated with the steering gear lubricant before installing the cross shaft in the housing.

(22) Make certain some lash exists between the cross shaft sector teeth and the ball nut rack then install and tighten the cover bolts to 25 foot pounds torque.

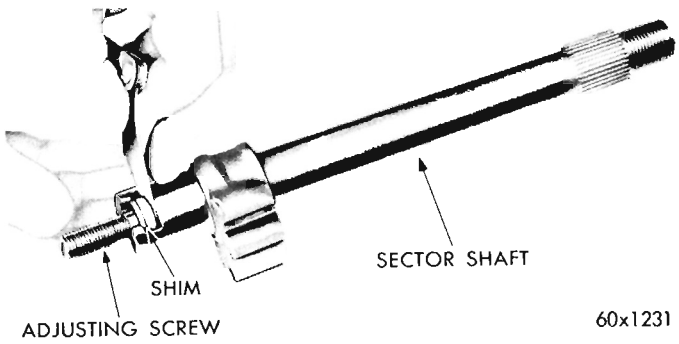


Fig. 13—Checking the Cross Shaft Adjusting Screw End Clearance

6. CROSS SHAFT OIL SEAL REPLACEMENT

The cross shaft oil seal may be replaced by this procedure either on the bench, or without removing the steering gear from the vehicle.

NOTE: When replacing the oil seal in the vehicle clean the exposed portion of the cross shaft to help prolong oil seal life.

Removal

(1) Slide the threaded adapter of Tool C-3880 over the end of the cross shaft and install the nut portion of the tool on the shaft (Fig. 14). Maintain pressure on the adapter with the tool nut while screwing the adapter into the seal until it grips the oil seal firmly. Place the two half rings and retainer

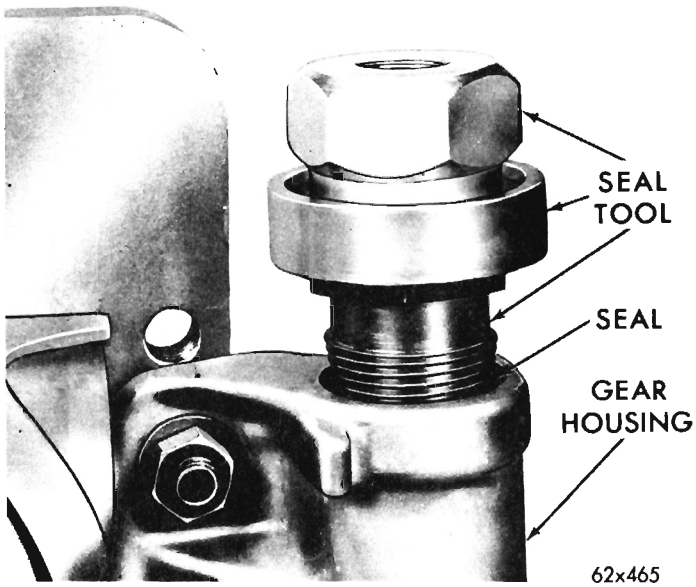


Fig. 14—Removing the Cross Shaft Oil Seal

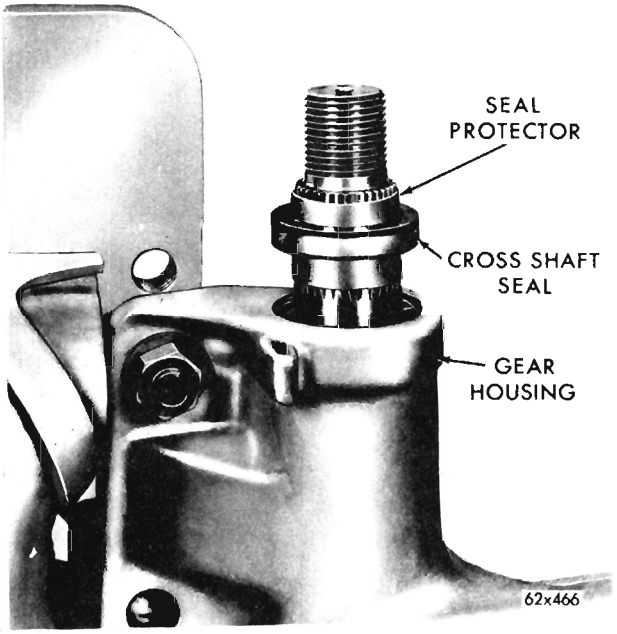


Fig. 15—Cross Shaft Oil Seal Protector

over both portions of the tool. Turn the tool nut counter-clockwise to withdraw the seal from the housing.

Installation

(1) Place the cross shaft seal on the seal protector sleeve from Tool Set C-3880 by carefully sliding the seal over the tapered end of the sleeve so the lip of the seal faces the tapered end of the sleeve.

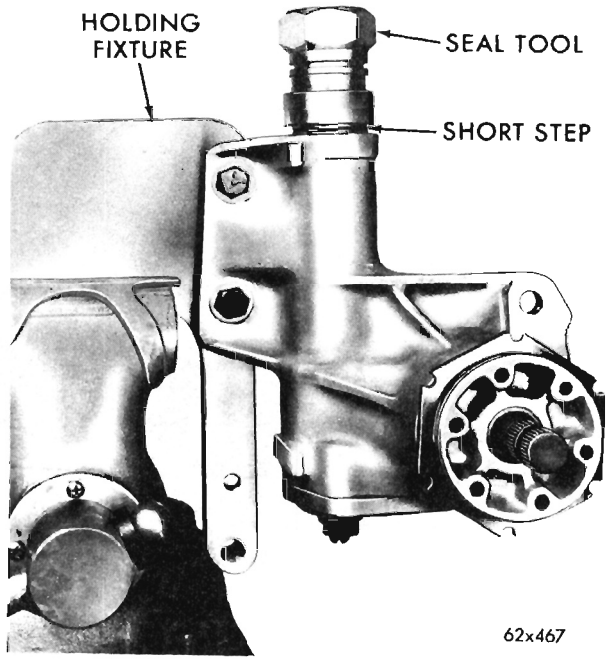


Fig. 16—Installing the Cross Shaft Oil Seal

(2) Place the seal and protector sleve assembly onto the splines on the cross shaft with the lip of the seal facing the gear housing (Fig. 15).

(3) Slide the seal down off the protector sleeve onto the cross shaft and remove the sleeve.

NOTE: A piece of tape can be wrapped around the end of the sleeve, opposite the tapered end, to provide a better grip when removing the sleeve.

(4) Place the installing adapter from Tool C-3880 against the seal with the **short step end** toward the seal (Fig. 16).

(5) Place the nut down from Tool set C-3880 on the cross shaft, and turn it down against the adapter, pressing the seal into the housing until the step on the adapter contacts the end of the housing.

7. BALL NUT RACK AND SECTOR MESH ADJUSTMENT (Out of Vehicle)

The ball nut rack and sector mesh adjustment can be accurately made only after proper worm bearing preload has been established.

(1) Turn the wormshaft to the midpoint of its travel. When the gear is exactly centered, the master spline on the wormshaft will be at the 12 o'clock position when viewed with the gear positioned as it would be when installed in the vehicle.

(2) Turn the cross shaft adjusting screw clockwise to take out all lash between the ball nut rack and sector gear teeth, then tighten the adjusting screw lock nut (Fig. 17).



Fig. 17—Cross Shaft Adjustment

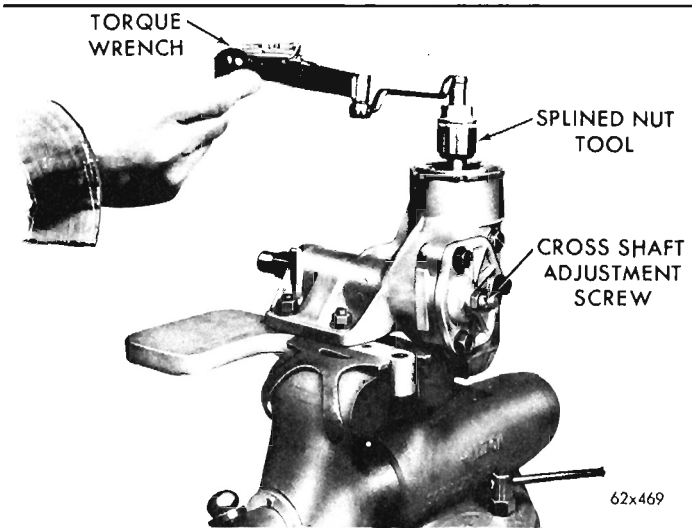


Fig. 18—Testing the Ball Nut Rack and Cross Shaft Sector Mesh

(3) Turn the worm shaft about ¼ turn away from the center or "high-spot" position. Again using splined adapter from Tool Set C-3884 and Tool C-3380 torque wrench (Fig. 18) rotate the wormshaft through the center or "high spot" position, observing the rotating torque required to turn the gear through the high spot. The reading should be between 7⅞ and 11¼ inch pounds. This represents the total of the worm bearing preload and the sector gear mesh load.

(4) Readjust the cross shaft adjustment screw if necessary to obtain the proper torque reading. Be sure the adjusting screw lock nut is tight whenever a preload torque reading is taken.

(5) With the steering gear positioned in a vise at its operating angle, fill the gear housing with approved steering gear lubricant so level of lubricant covers top of worm.

Installing the Steering Gear (In the Vehicle)

(1) Slide the steering column assembly upward to where the column coupling will clear the end of the wormshaft and permit installation of the steering gear. Also make sure the clamp is in place on the steering shaft coupling.

NOTE: On models equipped with six cylinder engines the steering gear can be entered through the hood opening. However, when installing the steering gear in models equipped with eight cylinder engines, limited clearance makes it necessary to place the gear in position from underneath the vehicle.

(2) Position the steering gear in position and install the three mounting bolts.

(3) Tighten mounting bolts to 50 foot pounds torque.

(4) With the master serration on the wormshaft aligned with the notch mark on the coupling housing slide the steering column assembly down far enough to engage the column coupling with the wormshaft.

(5) Align the groove on the steering column coupling with the groove in the wormshaft and install the coupling bolt, washer and nut.

(6) Tighten the nut to 30 foot pounds torque.

(7) While the jacket clamp bolts are loose, position the jacket assembly so the steering shaft coupling is centered at the midpoint of its travel.

The coupling travel midpoint can be determined by a $^{3}/_{16}$" diameter gauge hole which is provided in the steering shaft (Fig. 19).

When the dimension from the top of the coupling to the center of the gauge hole is $^{13}/_{16}$ inch the coupling is centered in its travel.

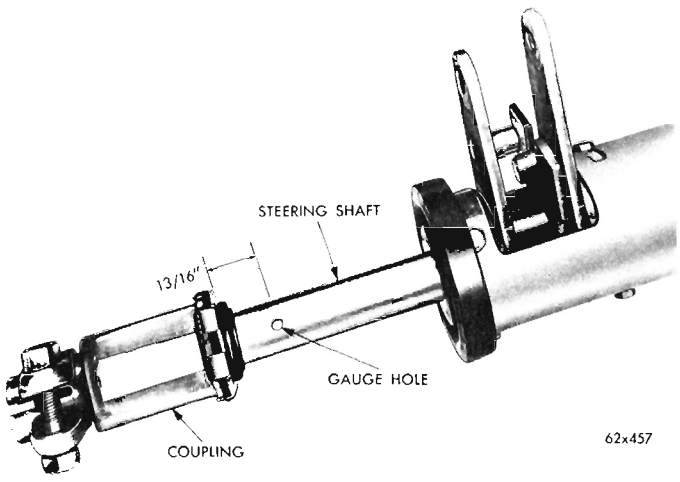


Fig. 19—Positioning the Steering Shaft Coupling (Manual Steering and Standard Transmission)

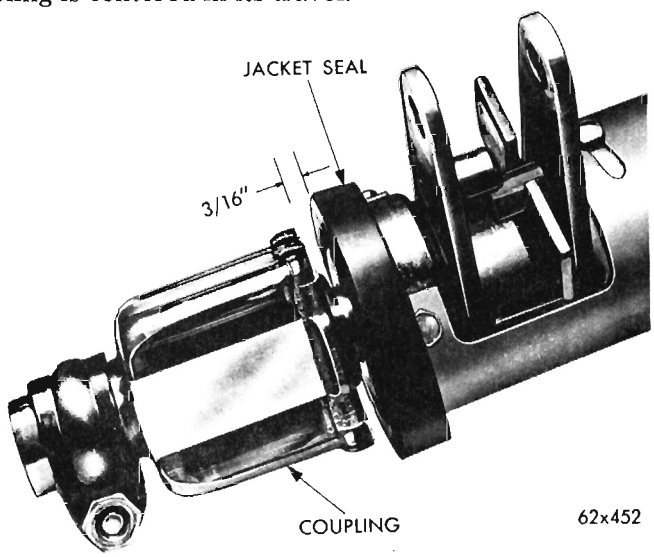


Fig. 20—Positioning the Steering Shaft Coupling (Power Steering and Standard Transmission)

NOTE: On Valiant models with both power steering and standard transmission, the column jacket should be positioned so the dimension between the top of the coupling and the column jacket seal is $^3/_{16}$ inch (Fig. 20).

(8) After centering the coupling, tighten the column jacket to instrument panel clamp bolts to 95 inch pounds torque.

NOTE: On vehicles equipped with manual transmission and concentric shift linkage, it will be necessary to readjust the length of the 1st and reverse shift rod and the 2nd and 3rd shift rod after the steering column assembly has been secured in position. See "Manual Transmission Linkage Adjustments".

(9) Turn the steering gear and steering wheel to the midpoint of its travel.

(10) Place the front wheels in the straight ahead position so the master serrations in the steering gear arm align with those on the steering cross shaft.

(11) Install the steering gear arm, lock washer and nut on the cross shaft and tighten the nut to 120 foot pounds torque.

(12) After the steering gear has been completely installed, test the steering wheel to be sure it is centered in the straight ahead position. If it is found to be off center with the wheels straight ahead, adjust the tie rods to center the wheel. See Group 2, "Front Suspension".

SERVICE DIAGNOSIS

MANUAL STEERING

Condition	Possible Cause	Correction
Hard Steering	(a) Low or uneven tire pressure.	(a) Inflate the tires to recommended pressures.
	(b) Insufficient lubricant in the steering gear housing or in steering linkage.	(b) Lubricate as necessary.
	(c) Steering gear shaft adjusted too tight.	(c) Adjust according to instructions.
	(d) Front wheels out of line.	(d) Align the wheels. See "Front Suspension".
	(e) Steering column misaligned.	(e) See "Steering Gear Alignment".
Pull to One Side (Tendency of the Vehicle to veer in one direction only)	(a) Incorrect tire pressure.	(a) Inflate the tires to recommended pressures.
	(b) Wheel bearings improperly adjusted.	(b) See "Front Wheel Bearing Adjustment".
	(c) Dragging brakes.	(c) Inspect for weak, or broken brake shoe spring, binding pedal.
	(d) Improper caster and camber.	(d) See "Front Wheel Alignment Group".
	(e) Incorrect toe-in.	(e) See "Front Wheel Alignment Group".
	(f) Grease, dirt, oil or brake fluid on brake linings.	(f) Inspect, replace and adjust as necessary.
	(g) Front and rear wheels out of alignment.	(g) Align the front wheels. See "Front Suspension Group".
	(h) Broken or sagging rear springs.	(h) Replace the rear springs.
	(i) Bent suspension parts.	(i) Replace the parts necessary.

SERVICE DIAGNOSIS—(Continued)

MANUAL STEERING

Condition	Possible Cause	Correction
Wheel Tramp (Excessive Vertical Motion of Wheels)	(a) Incorrect tire pressure.	(a) Inflate the tires to recommended pressures.
	(b) Improper balance of wheels, tires and brake drums.	(b) Balance as necessary. See "Wheels and Tires".
	(c) Loose tie rod ends or steering connections.	(c) Inspect and repair as necessary.
	(d) Worn or inoperative shock absorbers.	(d) Replace the shock absorbers as necessary.
Excessive Play or Looseness in the Steering Wheel	(a) Steering gear shaft adjusted too loose or badly worn.	(a) Replace worn parts and adjust according to instructions.
	(b) Steering linkage loose or worn.	(b) Replace worn parts. See "Front Wheel Alignment".
	(c) Front wheel bearings improperly adjusted.	(c) Adjust according to instructions.
	(d) Steering arm loose on steering gear shaft.	(d) Inspect for damage to the gear shaft and steering arm, replace parts as necessary.
	(e) Steering gear housing attaching bolts loose.	(e) Tighten the attaching bolts to 50 foot-pounds torque.
	(f) Steering arms loose at steering knuckles.	(f) Tighten according to torque specifications.
	(g) Worn ball joints.	(g) Replace the ball joints as necessary. See "Front Suspension".

STEERING COLUMN GEARSHIFT

The new concentric gear shift utilizes a hollow-tube inside the steering column jacket to transmit shift lever motions to the lower shift linkage (Fig. 1). The shift mechanism is supported by resin bearings and requires very little maintenance. Lubrication is required at 32,000 mile intervals.

SERVICE PROCEDURES

1. STEERING COLUMN AND GEARSHIFT

Removal (From the Vehicle)

(1) Disconnect the battery cable at the battery negative terminal.

(2) Disconnect the shift linkage rods from the shift tube levers at the bottom of the steering column assembly.

(3) Remove the steering shaft coupling to worm-shaft clamp bolt.

NOTE: The bolt must be completely removed since it engages a groove in the wormshaft.

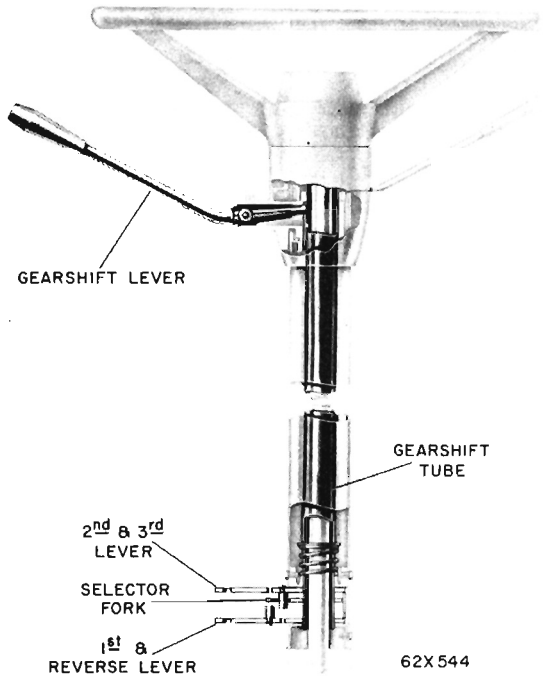


Fig. 1—Steering Column with the Concentric Gearshift

(4) Disconnect the directional signal, and horn wires.

(5) Remove the horn button **on Valiant models** by inserting a small screw driver into the slot in the steering wheel at the edge of the horn button, and pry the horn button and retaining "O" ring out of the steering wheel.

NOTE: To remove the Plymouth horn button, turn the horn button ¼ turn counter-clockwise, and lift it out of the steering wheel. To remove the extra equipment horn ring ornament from Plymouth models, remove the 2 screws from the underside of the steering wheel.

(6) Remove the horn switch retaining screws.

(7) Disconnect the horn wire clip and remove the horn switch assembly.

(8) Remove the steering wheel retaining nut and washer.

(9) Remove the steering wheel, using puller Tool C-3428.

(10) Disconnect the steering column at the instrument panel bracket by removing the retaining screws and clamp.

(11) Remove the floor plate to toe board attaching screws.

(12) Lift the steering column assembly up and off the end of the wormshaft, and remove the assembly out through the passenger compartment being careful not to soil or damage the headlining.

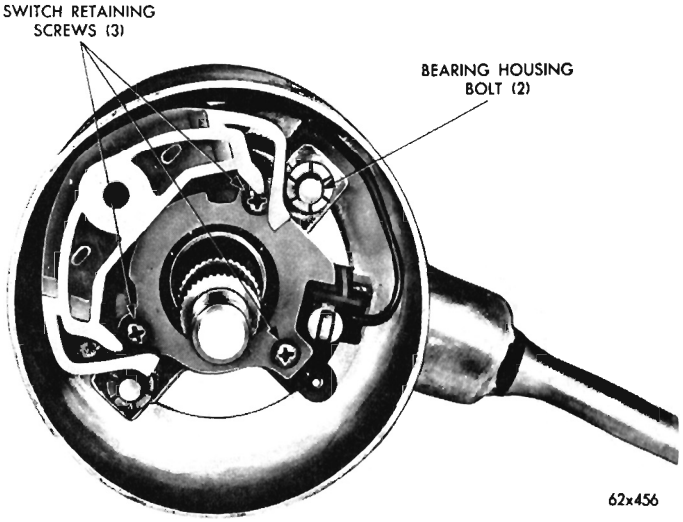


Fig. 2—View of the Steering Column-Upper End

Disassembly

(1) Remove the turn signal lever retaining screw and remove the lever.

NOTE: Disassemble, repair and assemble the steering column assembly on a clean, padded bench to protect the finish on the column jacket and related parts.

(2) Remove the three recessed head switch retaining screws (Fig. 2) and pull the turn signal switch and switch plate up and out, feeding the wires and connectors through the steering column jacket.

(3) Disengage the column jacket lower seal from the lip on the jacket, and slide the seal down toward the coupling.

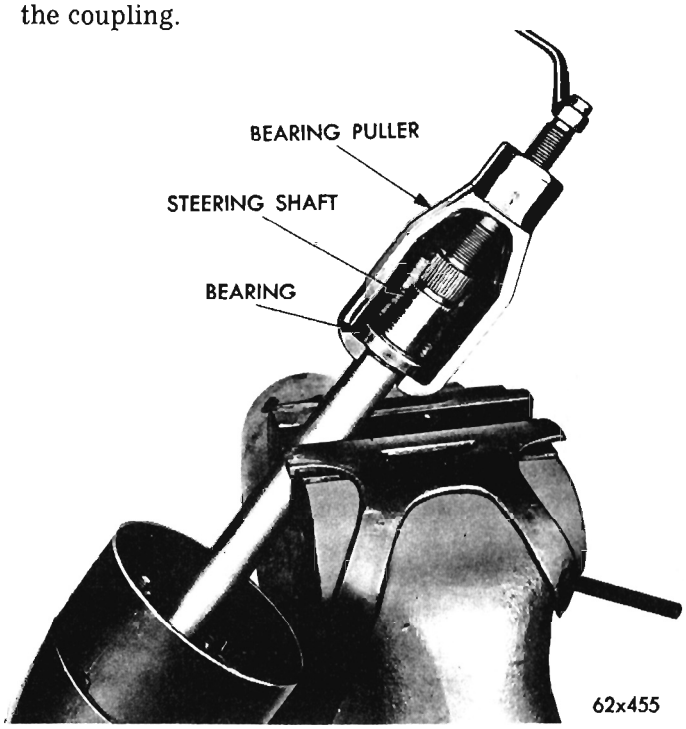


Fig. 3—Removing the Steering Shaft Bearing

(4) Exert an upward force on the steering shaft to force the steering column jacket upper bearing and insulator up and out of the counterbore in the bearing housing. Remove the insulator from the bearing.

NOTE: Due to the limited space between the joint and jacket tube on vehicles equipped with power steering and manual transmission, install the wheel nut on the column tube, then tap the column tube on a wood block to release the jacket tube, bearing and seal from the jacket tube.

(5) Using snap ring pliers Tool C-3128, remove the bearing upper snap ring from the upper groove in the steering shaft.

(6) Using bearing puller Tool C-3891, remove the steering column upper bearing (Fig. 3).

(7) Remove the lower snap ring and slide the steering shaft and coupling assembly down, and out of the steering column jacket assembly.

(8) Remove the column jacket lower seal from the steering shaft.

NOTE: The steering shaft and coupling assembly is serviced as an assembly, and is not to be disassembled.

(9) While supporting the gearshaft housing in the area around the shift lever pivot pin, drive out the pivot pin, using a $^{3}/_{16}$" punch, and remove the shift lever (Fig. 4).

NOTE: A $^{3}/_{8}$" drive, $^{3}/_{4}$" hex socket may be used to support the gearshift housing.

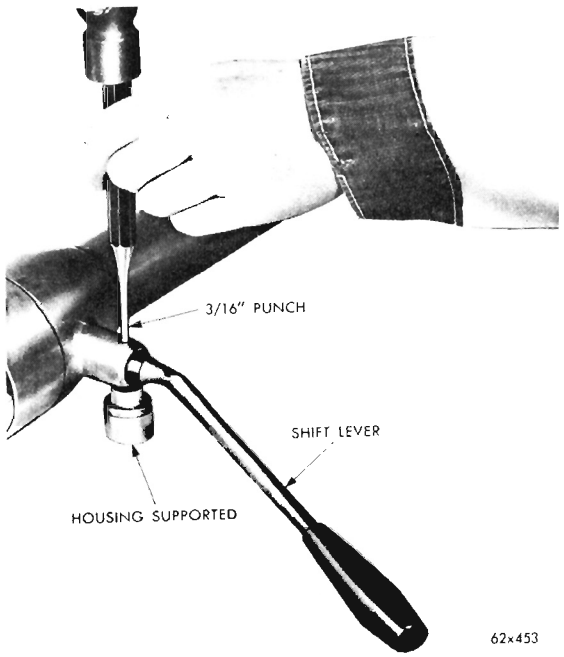


Fig. 4—Removing the Shift Lever Pivot Pin

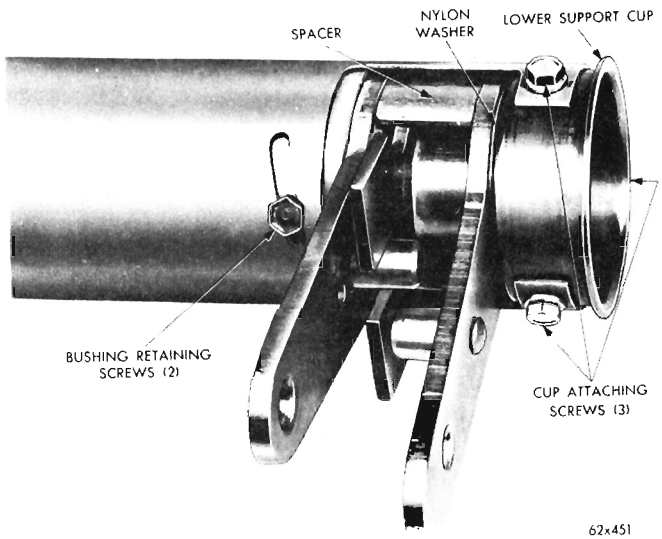


Fig. 5—Lower End of the Steering Column Tube Assembly

(10) Remove the three lower support cup to jacket attaching screws (Fig. 5) and remove the cup.

(11) Remove the nylon thrust washer, the low and reverse lever, and the spacer.

(12) Remove the two lower shift tube bushing retaining screws at the slotted holes in the jacket.

(13) Slide the shift tube with the 2nd and direct lever, nylon bushing, spring and spring retainer out of the jacket (Fig. 6).

NOTE: The shift tube assembly with 2nd and direct lever, spring, retainer and nylon bushing are serviced as an assembly, and are not to be disassembled.

(14) Remove the floor plate from the column jacket.

(15) Remove the hexagon nuts from the two bearing housing retaining bolts, and lift the steering

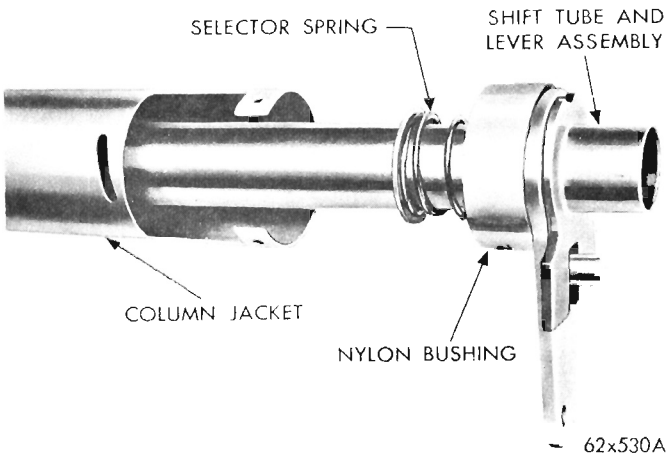


Fig. 6—Removing the Shift Tube Assembly

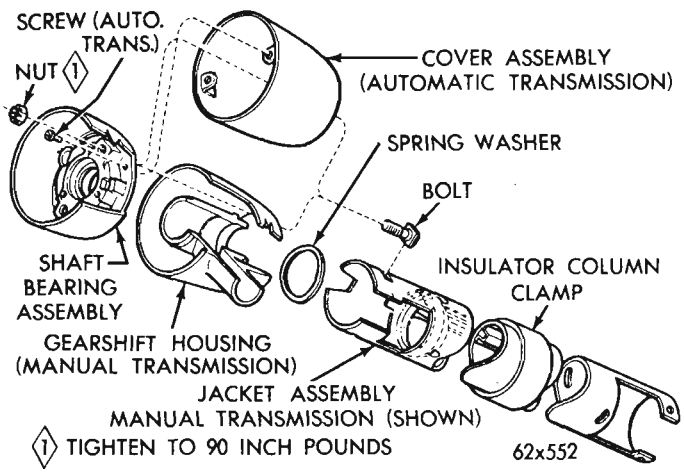


Fig. 7—Jacket Tube (Disassembled)

column upper bearing housing off the jacket assembly, as shown in Figure 7.

(16) Lift the gearshift housing and spring washer off the steering column jacket.

Inspection

After cleaning, inspect all parts for wear or damage. Note the condition of the pins in the two lower shift levers, the shift lever socket at the top end of the shift tube, and the inner end of the shift lever.

Inspect the steering shaft upper bearing for smooth operation, and lubricate with Multi-Purpose Chassis Lubricant or similar lubricant. If the bearing has any signs of roughness or wear, it should be replaced. Replacement bearings are pre-lubricated.

Assembly

(1) Position the spring washer on the ledge provided in the top end of the steering column jacket (refer to Figure 7), and place the shift lever housing in position at the top end of the column jacket.

(2) Place the two bearing housing retaining bolts in position in the housing, and just start the nuts on them.

(3) Stand the column assembly upright, and lower the bearing housing into position, engaging the bolt heads in the slots in the column jacket.

(4) Tighten the two retainer bolt nuts alternately and evenly in steps to prevent unseating the bolt heads from the slots. Tighten to 50 inch pounds.

(5) Position the isolator (refer to Figure 4) in the inside diameter of the floor plate, and install the floor plate on the steering column with the insulated side down.

NOTE: Before installing the floor plate and isolator on the column jacket, lubricate the inside diameter of the isolator with a soap solution or rubber lubricant. This will make it easier to slide the column up or down for proper positioning in the car when centering the steering shaft coupling.

(6) The floor plate assembly must be installed before installing the shift tube and levers, since this cannot be done after the shift tube and levers are in place in the steering column.

NOTE: Metal to metal working surfaces should be lubricated with Multi-Purpose Chassis Lubricant to facilitate installation.

(7) Turn the nylon bushing on the shift tube, as shown in Figure 6, so the two holes in the bushing are aligned with the centerline of the 2nd and 3rd speed shift lever, then slide the shift tube and lever assembly through the jacket tube and into the bearing housing.

(8) Install the spacer around the selector lever so it rests against the 2nd and 3rd speed shift lever.

(9) Install the low and reverse lever. Then install the nylon washer, centering it over the end of the shift tube.

(10) Install the lower support cup in the jacket (Fig. 5), while holding pressure against the cup to overcome the selector spring load, start the three support cup retaining screws, and tighten to 30 inch pounds.

(11) Loosely enter the lower bushing retaining screws through the slots in the jacket, and into the nylon bushings (Figs. 6 and 7).

(12) Rotate the nylon bushing to where all play at the shift levers and spacers is eliminated, but no binding occurs. With the bushing in this position, tighten the two bushings to jacket screws to 30 inch pounds torque.

NOTE: The shift tube must be free to slide up and down in its bushings. No binding is permissible.

(13) The gearshift lever insulator (Fig. 1) should be examined, and if any wear or damage is evident, it should be pulled off the lever and replaced.

NOTE: A worm gearshift lever insulator will result in a "thumping" or rattling sound in the steering column.

(14) Place a screw driver blade between the 2nd and 3rd speed shift lever and the selector lever, so it will hold the selector lever at neutral position half way between the two shift levers (Fig. 8).

(15) Position the gearshift lever in the shift lever housing so it engages the hole in the shift tube plate with the pin hole aligned.

(16) Support the jacket tube housing in the area

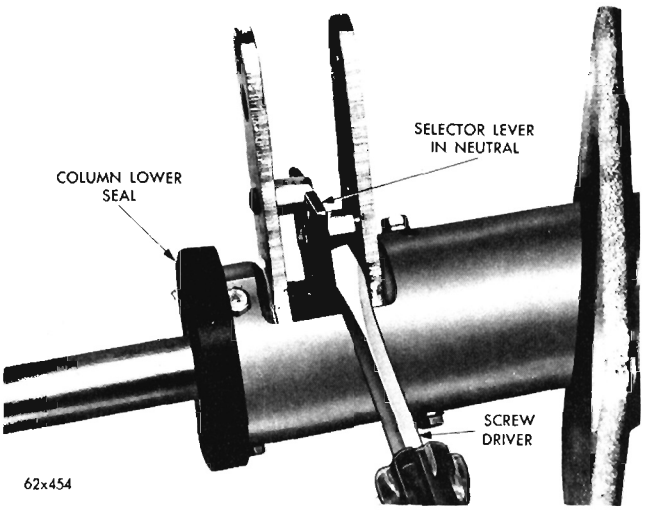


Fig. 8—Holding the Selector Lever in the Neutral Position

around the pin hole (Fig. 4) and drive the pivot pin in flush with the housing.

NOTE: Before sliding the column jacket lower seal onto the steering shaft, the seal should be lubricated. Fill the cavity in the inside diameter of the seal, between the two moulded in seal bushings with short fibre wheel bearing lubricant.

(17) Slide the seal onto the steering shaft, and down against the coupling, with the lip at the outside diameter facing upward, so the seal can be positioned on the lower end of the column jacket during assembly.

(18) Slide the steering shaft into the column assembly, and install the horseshoe shaped lower snap ring in the lower groove on the steering shaft.

(19) Place the steering column upper bearing on the steering shaft.

(20) Position the wavy upper snap ring against the top of the bearing.

Place bearing installing sleeve Tool C-3879 and the steering wheel retaining washer and nut, on the top of the steering shaft in that order (Fig. 9).

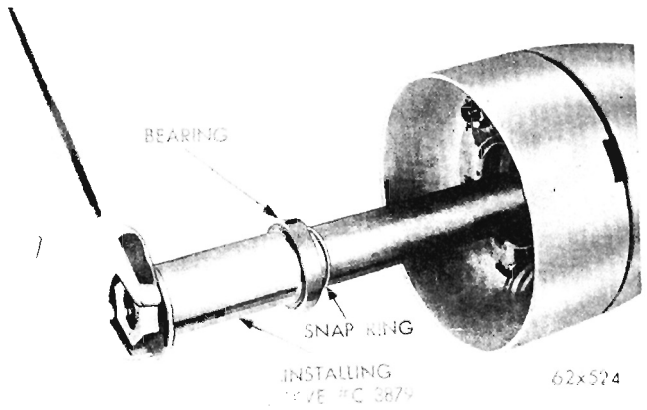


Fig. 9—Installing the Steering Column Upper Bearing

NOTE: Never press the bearing into position with a sleeve that exerts pressure against the outer race, since this would damage the bearing. Do not drive the bearing into place with a hammer, since damage to the bearing and steering shaft coupling will occur.

(21) Turn the steering wheel retaining nut to exert pressure on the installing sleeve, upper snap ring, and bearing, pressing the bearing down onto the knurled section of the steering tube and against the lower snap ring.

NOTE: The steering column upper bearing has approximately .001″ interference fit at knurled section of steering shaft.

(22) Exert sufficient pressure against the upper snap ring to flatten it against the bearing so it can enter the groove in the steering tube. Be sure the snap ring is firmly seated in the groove.

(23) Place the bearing insulator over the bearing column upper bearing, and position the bearing and insulator in the counterbore provided in the bearing housing.

(24) Position the directional switch assembly in the bearing housing, while feeding the turn signal and horn wires through the steering column and out through the opening provided in the column jacket.

(25) Place the switch plate over the switch, and install the three switch retaining screws (Fig. 22). Tighten screws to 24 inch pounds torque.

(26) Position the turn signal lever in the assembly, sighting down through the hole in the switch to align the screw hole, and install the lever attaching screw. Tighten screws to 24 inch pounds torque.

Installation (In the Vehicle)

(1) Insert the column and jacket tube assembly through the floor pan opening, being careful not to soil or damage the headlining.

(2) Position the clamp on the coupling and with the master splines on the worn shaft and coupling aligned, engage the column coupling with the steering gear worn shaft.

(3) Loosely fasten the steering column jacket to the instrument panel bracket with the clamp and the two attaching screws. Be sure the tab on the clamp is entered in the locating slot in the column jacket.

NOTE: The column jacket clamp must be installed

with the tab edge up on Plymouth models and tab edge down on Valiant Models.

(4) With the steering shaft coupling clamp in position on the coupling assembly, install the clamp bolt so that it engages the groove in the wormshaft. Tighten clamp bolt nut to 30 foot pounds torque.

(5) On Plymouth Models, the clearance between the column jacket and the edge of the instrument panel should be ¼ inch on the left, 5/16 inch on the top and 7/16 inch on the right. To adjust this clearance, also loosen the adjustment spacer to instrument attaching bolts. The spacer has elongated holes to allow for adjustment **up** or **down** on the steering column to provide the desired clearance. Do not tighten the clamp bolts at this time, however, the adjustment spacer to instrument panel attaching bolts should be tightened to 90 inch pounds torque.

(6) Position the steering jacket assembly so the steering shaft coupling is centered at the midpoint of its travel.

NOTE: With the steering column jacket clamp bolts loose, "free travel" in the steering shaft coupling along with the slotted bolt holes in the column clamp; permits the jacket and steering shaft assembly to move up and down (axially).

(7) A 3/16 inch gauge hole is provided in the steering column shaft. When the dimension from the top of the coupling to the centerline of the gauge hole is 1 3/16 inch (refer to Figure 19 "Manual Steering Gear") the coupling is centered in its travel.

NOTE: On Valiant Models equipped with both power steering and standard transmission, the gauge hole in the steering column shaft is concealed by the column jacket seal. On these models, the column jacket should be positioned so the dimension between the top of the coupling and the column jacket seal is 3/16 inch (refer to Figure 20 "Manual Steering Gear").

(8) With the coupling centered, tighten the column jacket to instrument panel clamp bolts to 95 inch pounds torque.

(9) Push the floor plate down to contact the toe board, and start the floor plate to toe board attaching bolts, leaving them just loose enough so the floor plate can be shifted to align the lower end of the column jacket.

(10) Visually inspect to be sure the lower end of the column jacket and shifter tube assembly is concentric with the steering shaft. If they are not concentric, shift the floor plate to a position where it holds the column jacket and shift tube assembly concentric with the steering shaft and tighten the floor plate to toe board attaching screws to 90 inch pounds.

NOTE: If the column jacket and shift tube assembly are not concentric it is possible for the steering shaft to rub on the inside surface of the shifter tube at the lower end.

(11) Recheck the lower end of the column jacket and shift tube assembly, to assure that they have remained concentric with the steering shaft after tightening the attaching screws.

(12) Slide the steering column lower seal up to the bottom end of the column jacket, and force the outer lip of the seal into position around the flanged lower end of the column jacket and shift tube assembly (Fig. 8).

(13) With the master splines in the steering wheel hub and steering shaft aligned, place the steering wheel on the steering shaft.

(14) Install the steering wheel retaining washer and nut. Tighten the steering wheel nut to 24 foot pounds torque.

(15) Install any horn switch parts previously removed from the steering wheel, and install the horn button or horn ring.

NOTE: On Valiant models equipped with a horn button, place the "O" ring in the groove in the horn button, and snap it into place in the steering wheel (or horn ring, if so equipped).

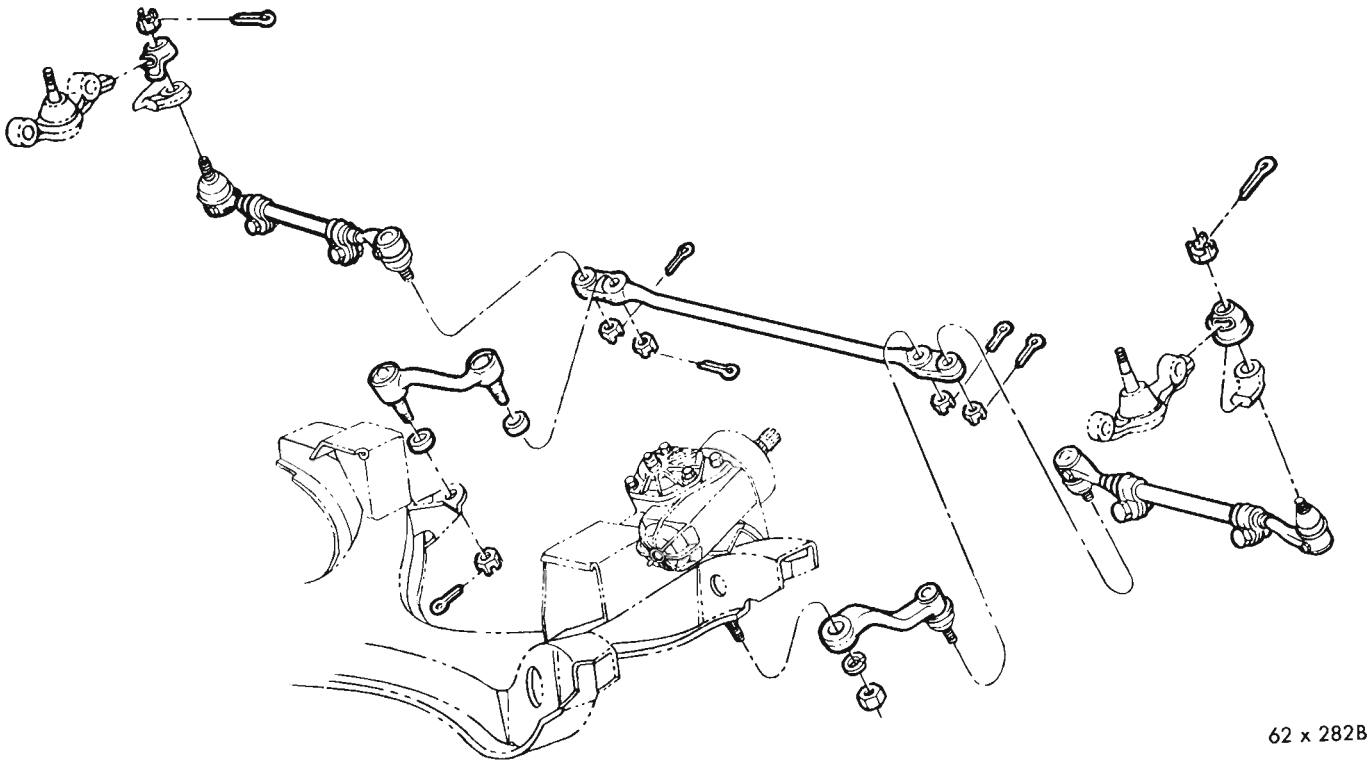


Fig. 1—Steering Linkage (Plymouth)

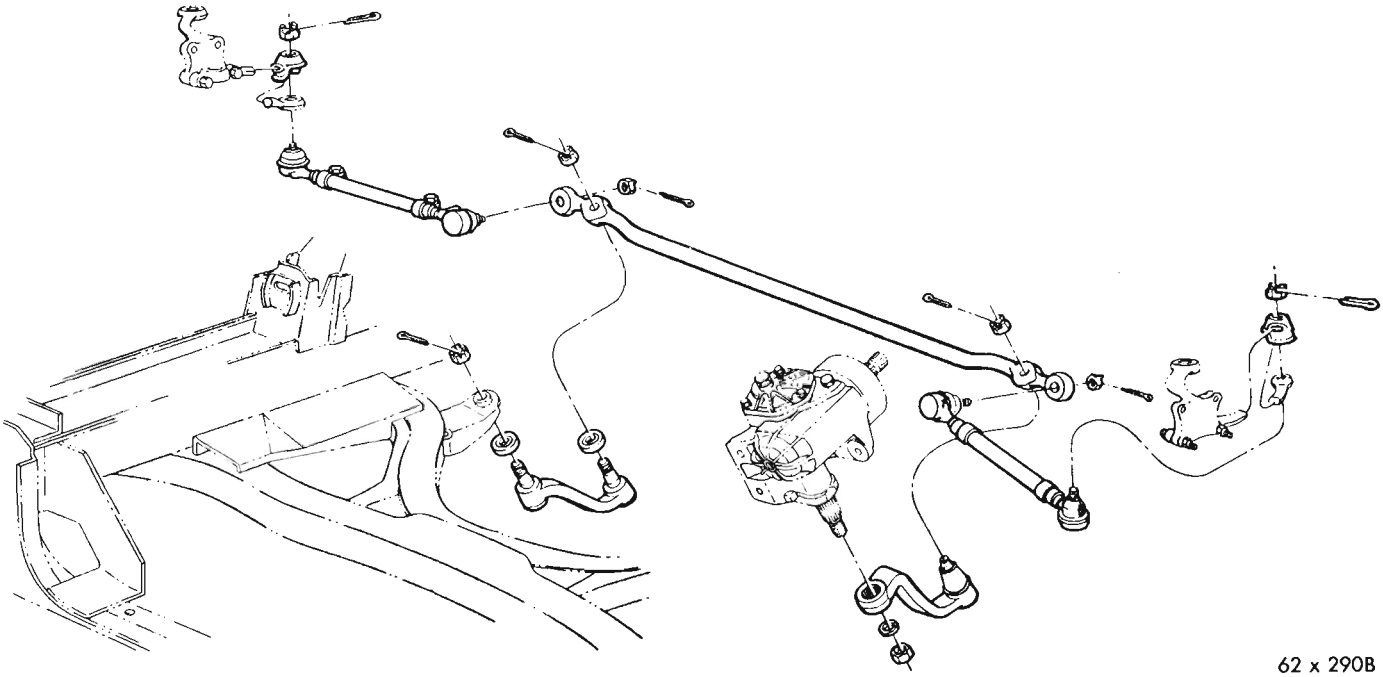


Fig. 2—Steering Linkage (Valiant)

PART 2
STEERING LINKAGE
SERVICE PROCEDURES

1. STEERING KNUCKLES

Removal

(1) Remove the upper control arm rebound bumper.

(2) Raise the vehicle so the front suspension is in full rebound (under no load).

(3) Remove the wheel and drum as an assembly.

(4) Remove all load from the torsion bar by backing off the adjusting bolt.

(5) Remove the upper ball joint stud from the steering knuckle using Tool C-3711.

(6) Remove the two upper bolts attaching the steer-knuckle to the brake support.

(7) Remove the two lower bolts attaching the steering arm to the steering knuckle and remove the steering knuckle.

NOTE: Support the brake assembly during this operation to prevent damage to the brake hose when the lower bolts are removed.

Installation

(1) Position the steering knuckle on the brake support and install the upper mounting bolts and nuts. Tighten the nut finger tight only.

(2) Position the steering knuckle arm on the steering knuckle and install the mounting bolts and nuts. Tighten the nuts finger tight only.

(3) Install the upper ball joint stud in the steering knuckle and tighten the ball joint stud nut 55 foot-pounds torque on Valiant and 100 foot-pounds torque on Plymouth. Install the cotter pin.

(4) Tighten the steering knuckle upper bolt nuts 55 foot-pounds torque. Tighten the lower bolt nuts to 100 foot-pounds torque on Valiant and 120 foot-pounds torque on Plymouth.

(5) Place a load on the torsion bar by turning in the adjusting bolt. See "Front Suspension", Group 2.

(6) Install the wheel and drum assembly.

(7) Adjust the front wheel bearings. Refer to "Wheels, Bearings and Tires", Group 22.

(8) Lower the vehicle to the floor.

(9) Install the upper control arm rebound bumper and tighten the nut 200 inch-pounds torque.

(10) Measure and adjust the front wheel alignment as necessary.

2. STEERING LINKAGE (Figures 1 and 2)

The tie rod end seals and covers should be inspected at all oil change periods.

Removal

CAUTION: Removal of the tie rod ends from the steering knuckle arm or the center link by methods other than using Tool C-3894 will damage the tie rod end seal.

Damaged seals require removal of the seals and inspection of the tie rod assembly end at the throat opening. If the parts have not lost all the grease or are not contaminated, worn or rusted, use new seals and reinstall, otherwise, a new complete tie rod end assembly should be installed. Lubricate the tie rod end assembly.

When removing the tie rod ends, idler arm or steering gear arm, all seals should be closely inspected for wear or damage. The tie rod ends are of the semi-permanently lubricated type.

(1) Remove the tie rod ends from the steering knuckle arms using Tool C-3894 (Fig. 3). **Use care not to damage the seals.**

(2) Using Tool C-3894, remove the inner tie rod ends from the link.

(3) Remove the idler arm stud from the link using Tool C-3894.

(4) Remove the idler arm stud from the "K" member, using Tool C-3894.

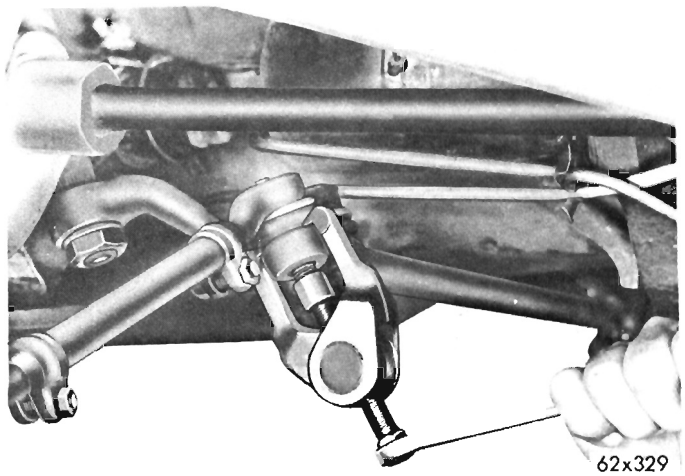


Fig. 3—Removing Tie Rod End Stud

(5) Remove the steering gear arm stud from the link, using Tool C-3894.

Installation

Replace all tie rod and steering arm assemblies that are damaged or worn.

(1) Position the idler arm stud in the bracket and install the washer and nut. Tighten nut to 45 foot-pounds maximum torque and install the cotter pin.

(2) Place the link over the idler arm stud and the steering gear arm stud and tighten the nuts to 40 foot-pounds torque. Install the cotter pins.

(3) Connect the tie rod ends to the steering knuckle arms. Tighten the nuts to 40 foot-pounds torque, slide the stone protector into position and install the cotter pins.

(4) Measure and adjust the front end toe. See "Front Suspension" Group 2.

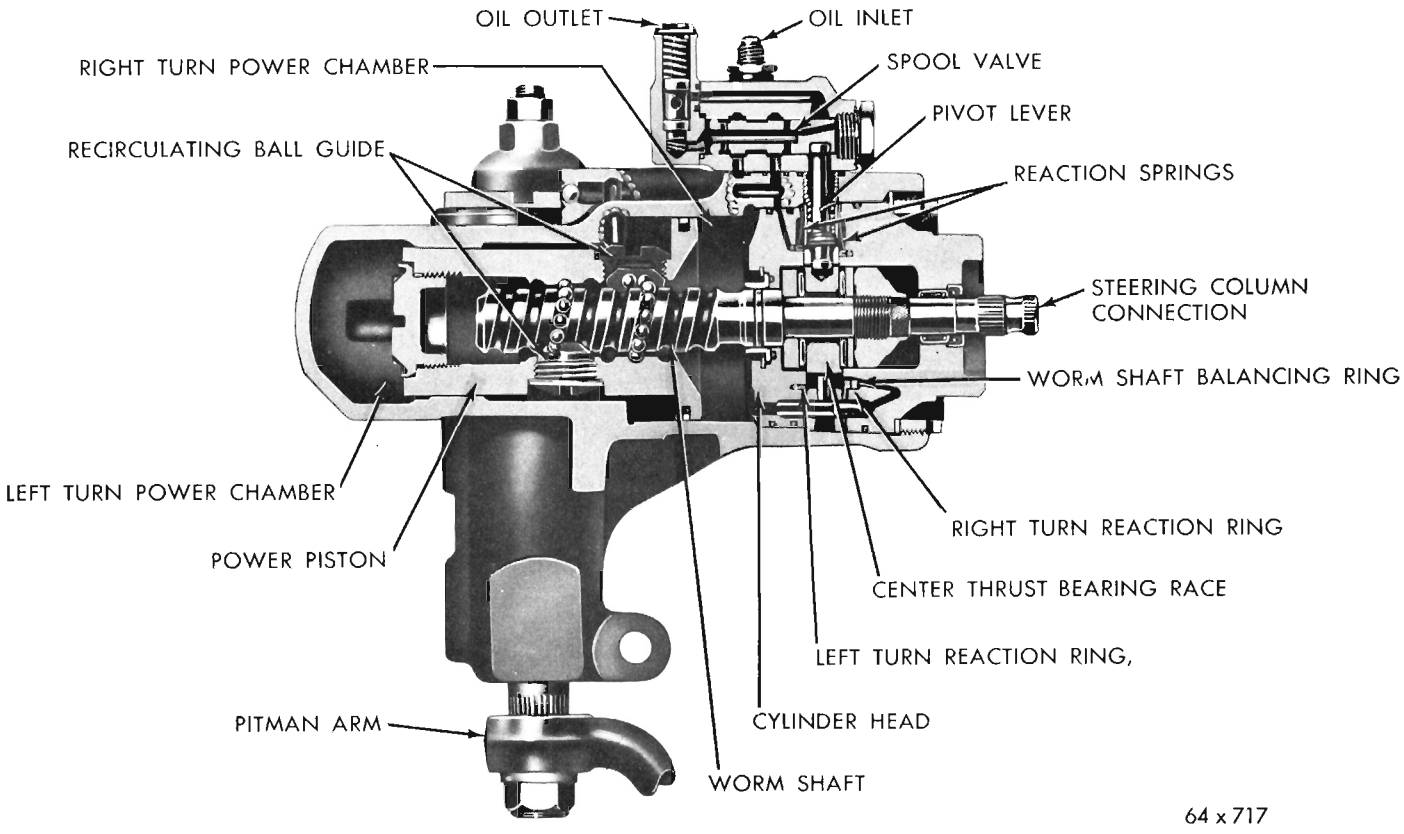


Fig. 1—Power Steering Gear (Sectional View— Typical)

PART 3

POWER STEERING GEAR

The power steering gear (Figs. 1 and 2) consists of a gear housing containing a gear shaft with sector gear, a power piston with gear teeth milled into the side of the piston which is in constant mesh with the gear shaft sector, and a wormshaft connecting the steering wheel to the power piston through a U-joint type coupling. The wormshaft is geared to the piston through recirculating ball contact. The steering valve, mounted on top of the steering gear, directs the flow of fluid in the system.

SERVICE PROCEDURES

1. GEAR SHAFT ADJUSTMENT—Unit in Vehicle

(1) Start the engine and run at idle speed.

(2) Turn the steering wheel gently from one stop all the way to the other, counting the number of turns. Then turn the wheel back exactly half way, to the center position.

(3) Loosen the adjusting screw until backlash is evident, then retighten adjusting screw until backlash just disappears. Continue to tighten to 3/8 to 1/2 turn from this position and tighten lock nut to 50 foot-pounds torque to maintain this setting.

2. GEAR SHAFT OIL SEAL REPLACEMENT

The gear shaft oil seal may be replaced without removing the steering gear from the vehicle.

Removal

(1) Remove the steering arm nut.

(2) Disconnect the steering gear arm from the gear shaft with Tool C-3646 (Fig. 3).

(3) Slide the threaded adapter SP-3609 of Tool C-3880 over the end of the gear shaft and thread the tool nut SP-3610 on the gear shaft. Maintain pressure on the threaded adapter with the tool nut while screwing the adapter far enough to engage the metal portion of the outer seal. Place the two half rings SP 1932, and Tool retainer ring over both portions of the tool, as shown in Figure 4. Turn the tool nut

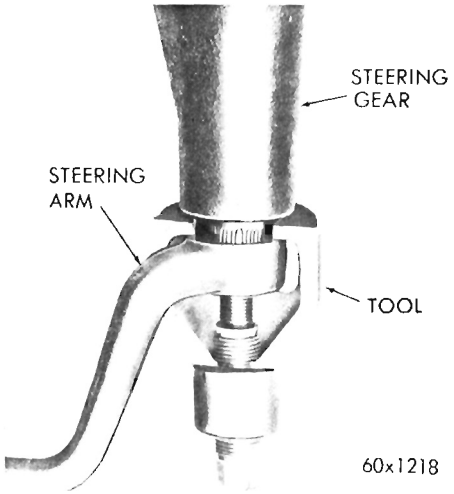


Fig. 3—Removing Steering Gear Arm

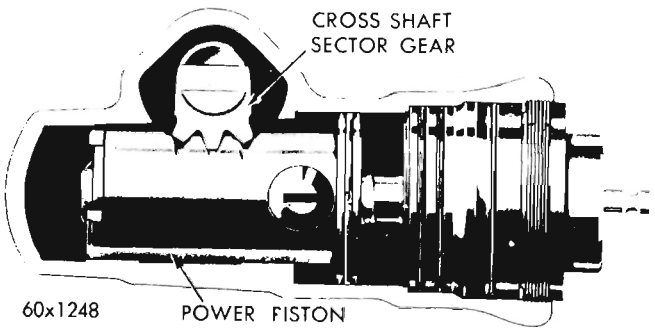


Fig. 2—Steering Gear Housing (Sectional View)

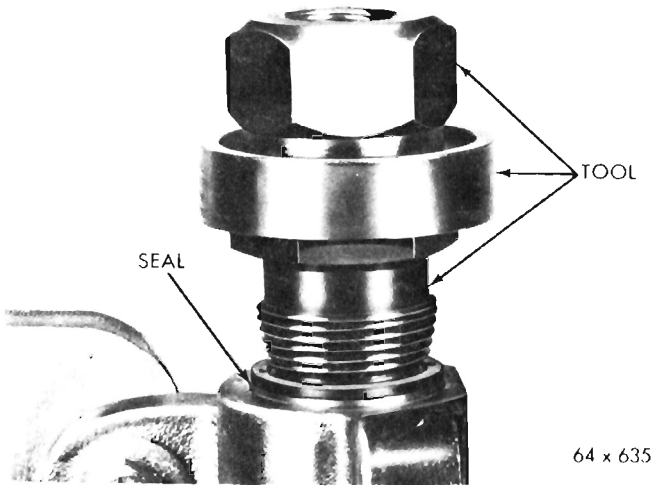


Fig. 4—Removing Gear Shaft Oil Seal

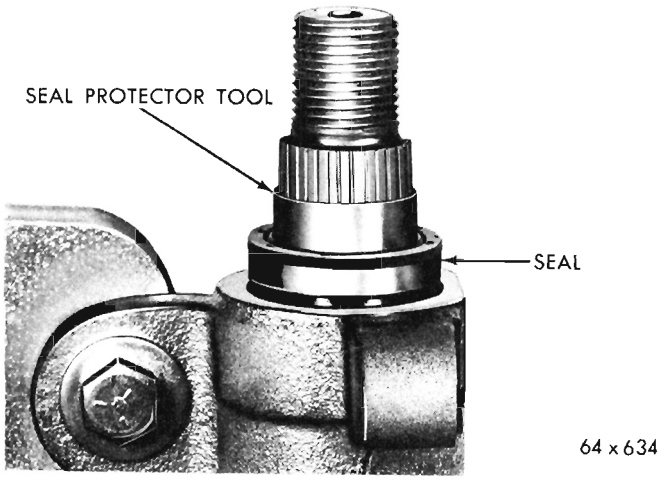


Fig. 5—Gear Shaft Oil Seal Protector

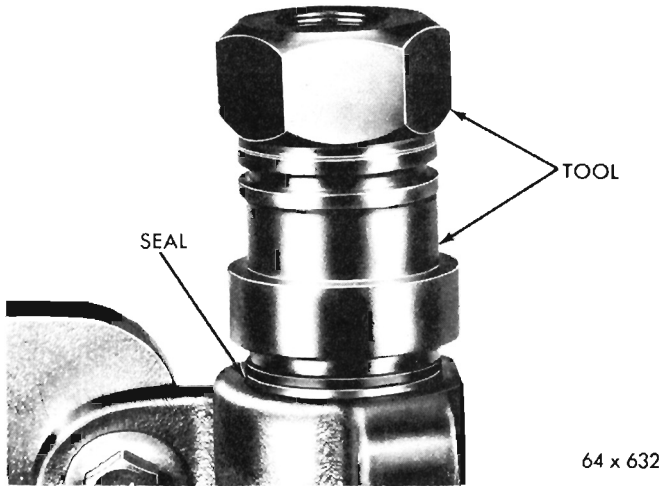


Fig. 7—Installing Gear Shaft Grease Retainer

counter-clockwise to withdraw the outer seal from the housing.

(4) Remove the oil snap ring with pliers Tool C-3229 and remove the seal back-up washer.

(5) Use Tool C-3880 in the same manner as outlined in step (3) to remove the inner seal.

Installation

(1) Place the seal protector SP 3613 of Tool C-3880 over the splines of the gear shaft and slide the inner seal over the protector with the lip of the seal down, as shown in Figure 5.

(2) Remove the seal protector SP 3613 and place tool adapter SP-3828 with the long step of adapter against the seal, as shown in Figure 6. Install tool nut on the gear shaft and tighten the tool nut until the shoulder of the tool adapter contacts the gear housing.

(3) Remove the tool nut and adapter and install the seal back-up washer and oil snap ring.

(4) Position the outer seal in the housing bore; place tool adapter SP-3828 with short step of lip against the seal (Fig. 7). Install tool nut on the gear-shaft and tighten the tool nut until the shoulder of the tool adapter contacts the gear housing.

(5) Place the steering gear and front wheels in the straight ahead position and install the steering gear arm and nut.

(6) Tighten the steering gear arm nut to 120 foot-pounds torque.

3. WORM SHAFT OIL SEAL REPLACEMENT

The worm shaft oil seal replacement requires removal of the steering gear assembly from the vehicle. Refer to Paragraph 4.

(1) Remove the oil seal with Tool C-3638 (Fig. 8).

(2) Slide the new oil seal over the protector (lip

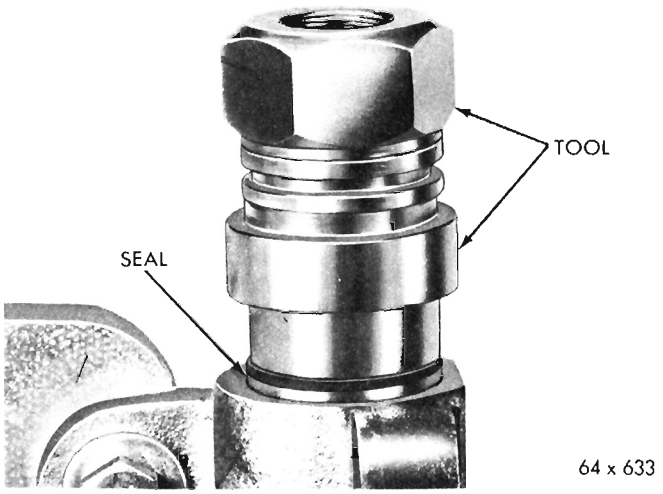


Fig. 6—Installing Gear Shaft Inner Oil Seal

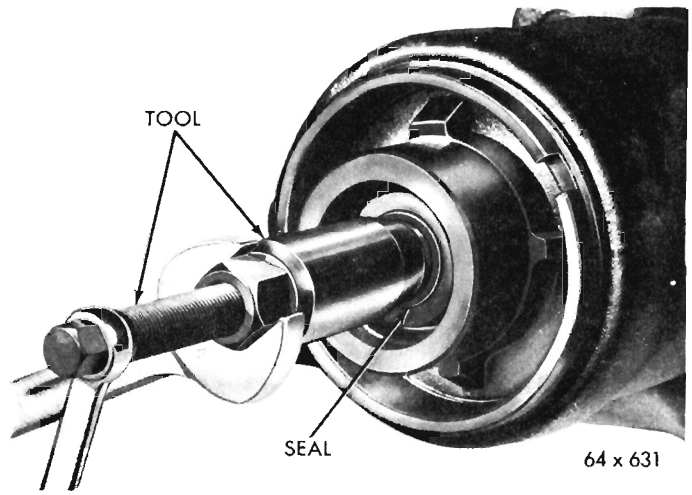


Fig. 8—Removing Worm Shaft Oil Seal

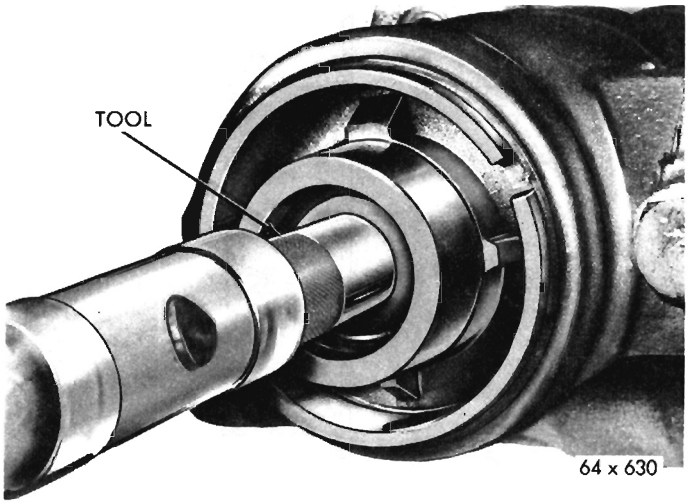


Fig. 9—Installing Worm Shaft Oil Seal

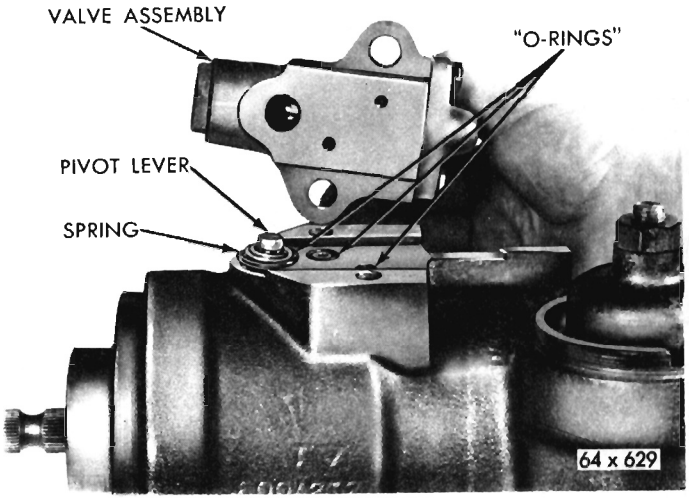


Fig. 10—Removing Steering Valve Assembly

of seal toward housing), then remove the seal protector.

(3) Drive the oil seal in place with Tool C-3650 (Fig. 9).

4. POWER STEERING GEAR

Removal

(1) Disconnect the battery negative ground cable at battery negative post.

(2) Remove the steering column coupling to worm shaft clamp bolt.

(3) Loosen the jacket tube clamp screw at the instrument panel.

(4) Tap the coupling assembly upward and carefully lift the steering column end jacket assembly up and off the end of the worm shaft.

NOTE: Tie the jacket tube to protect it against damage during the steering gear removal.

(5) Disconnect the pressure and return hoses at the steering gear valve. Fasten the ends of the hoses above oil level in the pump reservoir and cap ends of hoses and fittings of the steering valve.

(6) Raise the vehicle.

(7) Remove the gear shaft nut and washer and remove the steering arm from the gear shaft with Tool C-3646 (Fig. 3).

(8) Remove the bolts attaching the steering gear to frame and remove the steering gear assembly.

NOTE: On 6 cylinder engines, remove the steering gear through the engine compartment. On 8 cylinder engines, remove the unit from underneath the vehicle.

On 318 cubic inch engines, remove the starting motor. Do not damage oil cooler lines on units so equipped.

Disassembly

Prior to disassembly, clean the gear assembly thoroughly in a suitable solvent and install unit in holding fixture Tool C-3323. Remove and discard all "O" seal rings and seals, using new ones lubricated with petrolatum when reassembling. To disassemble the power steering unit for repair or overhaul, refer to Figure 1 then proceed as follows:

(1) Drain the steering gear through the pressure and return connections by turning the steering worm shaft from one extreme of travel to the other.

(2) Remove the valve body attaching screws, and remove the valve body and the three "O" rings (Fig. 10).

(3) Remove the pivot lever and spring. Pry under the spherical head with a screw driver (Fig. 11).

NOTE: Use care not to collapse slotted end of the valve lever as this will destroy the bearing tolerances of the spherical head.

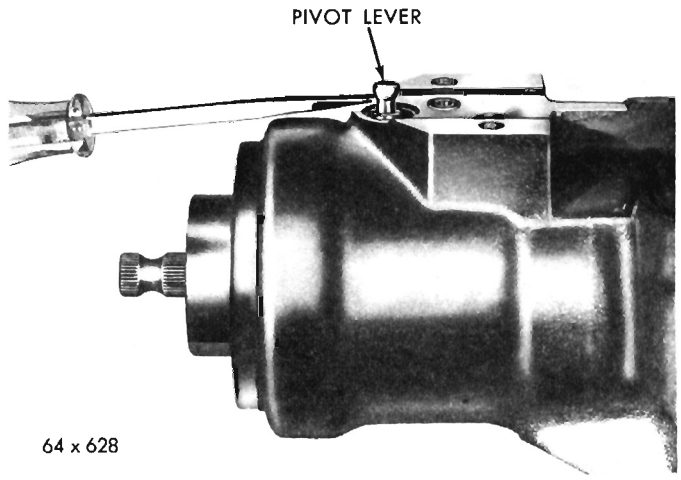


Fig. 11—Removing the Pivot Lever

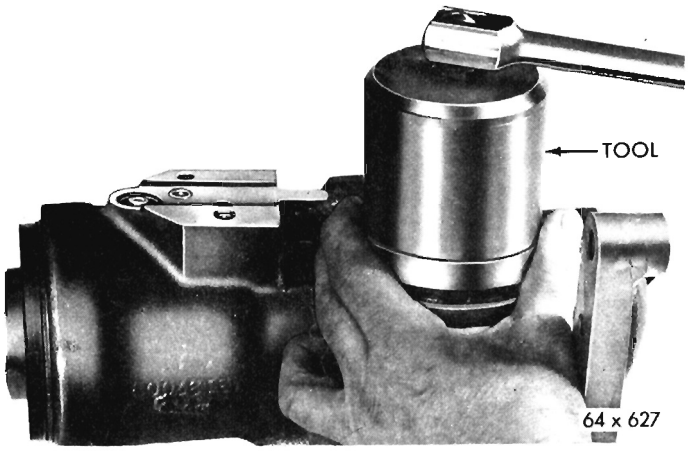


Fig. 12—Removing the Gear Shaft Cover Retaining Nut

(4) Remove the gear shaft oil seal inner and outer as outlined in Paragraph 2, "Gear Shaft Oil Seal Replacement".

(5) Loosen the gear shaft adjusting screw locknut to facilitate removal and remove the gear shaft cover nut with Tool C-3633 (Fig. 12).

(6) Rotate the worm shaft to position the gear shaft sector teeth at the center of the piston travel then loosen the steering power train retaining nut with Tool C-3634 (Fig. 13).

CAUTION: Oil will drain out when the gear shaft and cover are withdrawn from the gear housing.

(7) Withdraw the gear shaft just enough so that the sector gear teeth clear the housing, then rotate the shaft 180 degrees and allow the ends of the gear teeth to rest on the housing (Fig. 14).

(8) Turn the worm shaft to the full left turn position to compress the power train parts, then remove the power train retaining nut and washer.

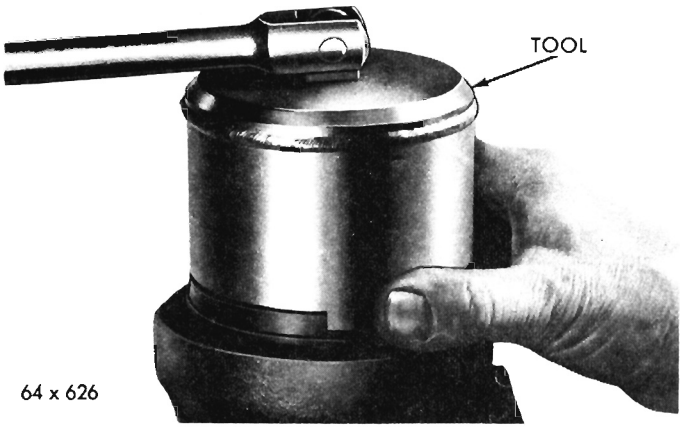


Fig. 13—Removing the Power Train Retaining Nut

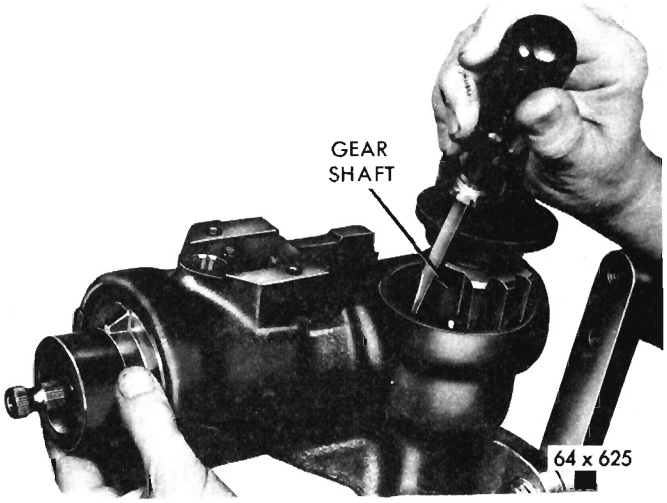


Fig. 14—Removing the Power Train (Typical)

(9) While holding the power train firmly compressed, pry on the piston teeth with a screw driver using the gear shaft as a fulcrum and remove the complete power train (Fig. 14).

NOTE: It is important that the cylinder, center race and spacer assembly and the jacket support be maintained in close contact with each other. This will prohibit the teflon sealing ring on the worm shaft from becoming disengaged from its retainer in the cylinder head. It will also eliminate the possibility of the reaction rings becoming disengaged from their grooves in both the cylinder head and worm shaft support.

(10) Place Tool C-3875 on the threaded end of the gear shaft, then slowly remove the shaft while sliding the tool into the housing. The tool will prevent the needle bearings from falling out of the cage.

Cleaning and Inspection

When disassembling, each part should be placed in a suitable solvent, washed, then dried by compressed air. Careful handling of parts must be exercised to avoid the occurrence of nicks and burrs. Crocus cloth may be used to remove small nicks or burrs provided it is used carefully. When used on the steering gear valve, use extreme care not to round off the sharp edge portions of the two lands located between the valve drilled holes. The sharp edge portion of these two lands is vitally important to this type of valve.

Power Train Disassembly (Figs. 1 and 15)

(1) Place the power train in a vise equipped with soft jaws to avoid damaging the piston assembly.

CAUTION: Do not turn the worm shaft more than one-half turn during disassembly.

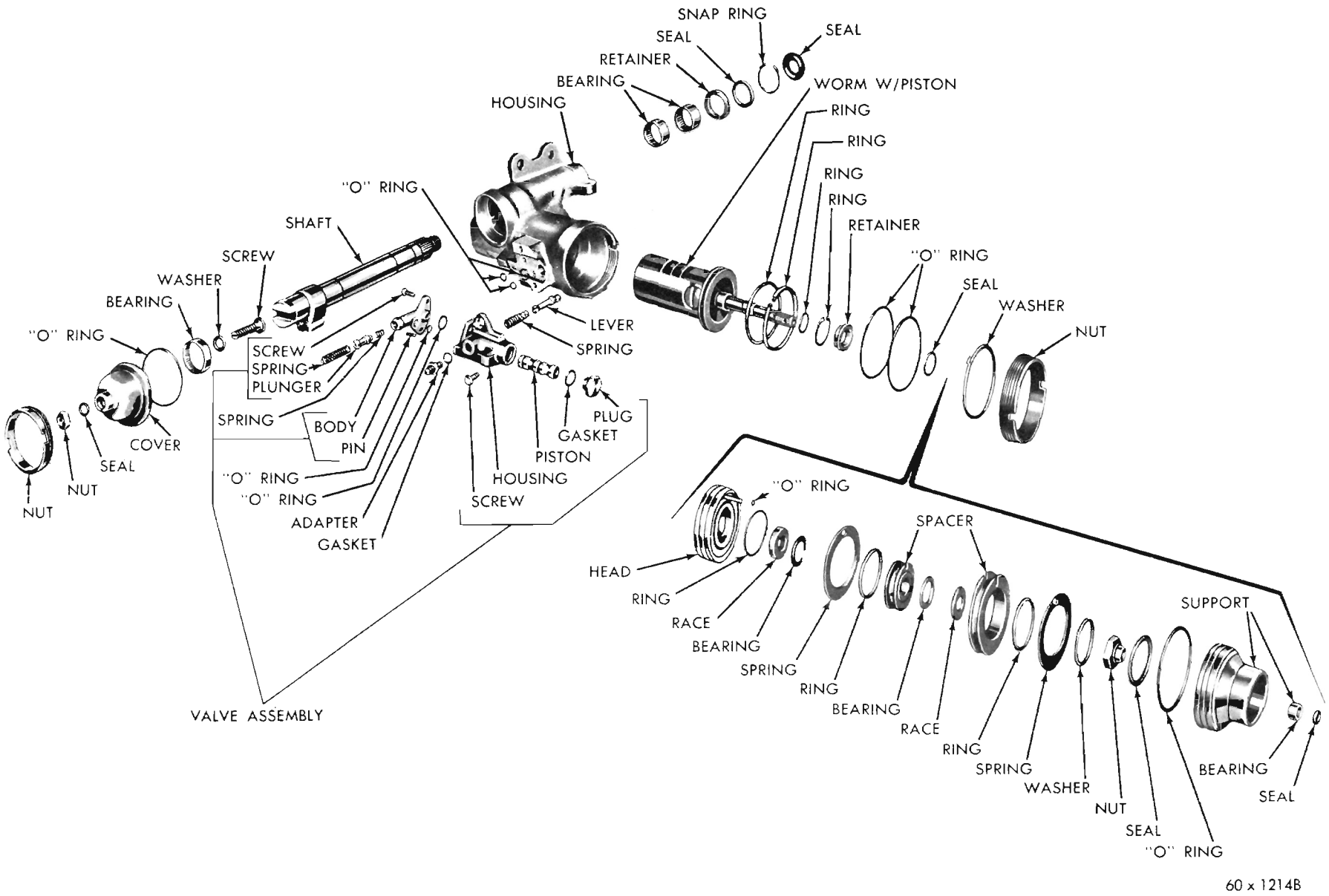


Fig. 15—Steering Gear—Disassembled View (Typical)

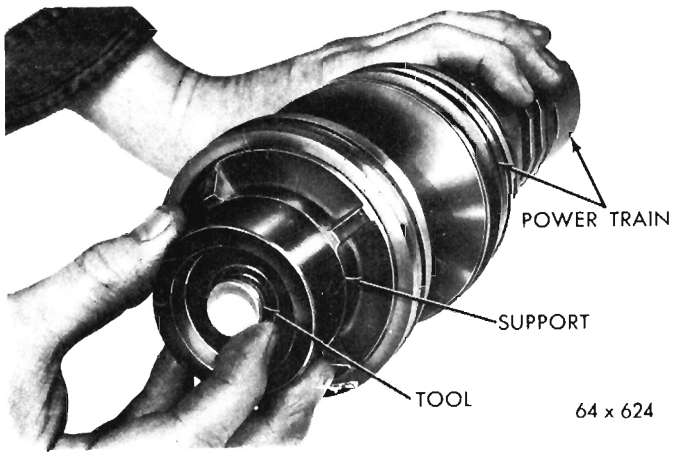


Fig. 16—Retaining the Bearing Rollers with Arbor Tool

(2) Remove the worm shaft support tang washer.

NOTE: The 33 support bearing rollers may fall out when the column support is removed from the worm shaft. Use arbor Tool C-3929 (Fig. 16), to hold rollers in position when the support is removed.

(3) Raise the column support until the worm shaft oil seal just clears the top of the worm shaft and position the arbor Tool C-3929 on top of the worm shaft and into the oil seal. With the arbor in position pull up on the jacket support until the arbor is positioned in the support bearing then remove support and arbor.

NOTE: To install new rollers, retain the rollers in the cage with wheel bearing lubricant.

NOTE: If the worm shaft oil seal is to be replaced, perform the operation with the worm shaft support assembled in the steering gear housing (Figs. 8 and 9).

(4) Remove the large "O" ring from the groove in the shaft support.

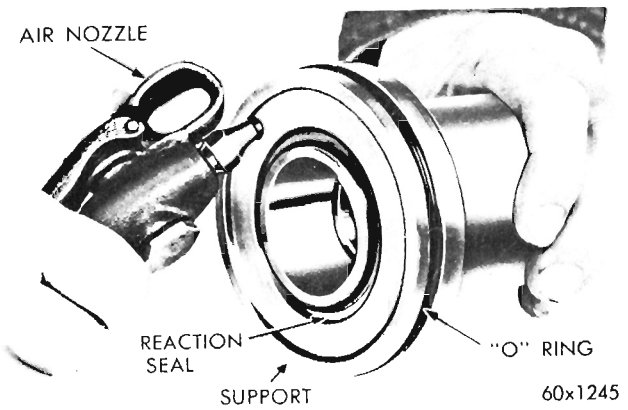


Fig. 17—Removing the Reaction Seal from the Worm Shaft Support

(5) Remove the reaction seal from the groove in the face of the support with air pressure directed into the ferrule chamber (Fig. 17).

(6) Inspect all grooves for burrs. Make sure the passage from the ferrule chamber to the upper reaction chamber is unobstructed.

(7) Remove the reaction spring, reaction ring, worm balancing ring and spacer, ferrule "O" ring and center bearing spacer.

(8) Hold the worm shaft from turning, then turn the nut with sufficient force to release the staked portions from the knurled section and remove the nut.

NOTE: Wire brush the knurled section to remove the chips, then blow out the nut and worm shaft to remove any metal particles.

(9) Remove the upper thrust bearing race (thin) and upper thrust bearing.

(10) Remove the center bearing race.

(11) Remove the lower thrust bearing and lower thrust bearing race (thick).

(12) Remove the lower reaction ring and reaction spring.

(13) Remove the cylinder head assembly.

(14) Remove the two "O" rings in the two outer grooves in the cylinder head.

(15) Remove the reaction "O" ring from the groove in the face of the cylinder head with air pressure directed into the oil hole located between the two "O" ring grooves (Fig. 18).

(16) Remove the retainer, back-up ring and oil seal from the cylinder head counterbore (Fig. 19). Inspect the seal for possible damage and replace the seal if necessary.

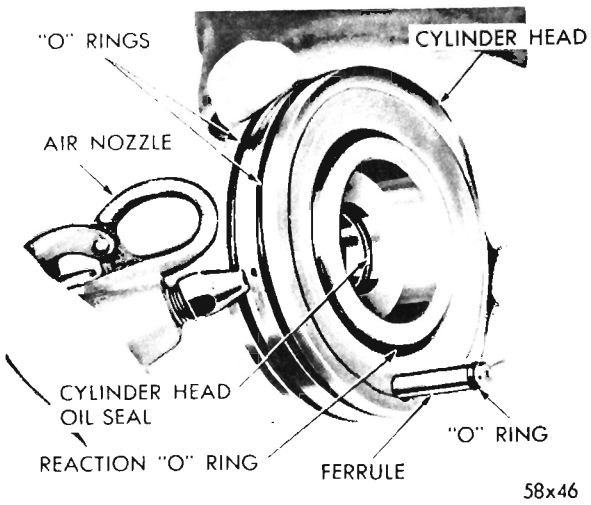


Fig. 18—Removing the Reaction Ring from the Cylinder Head

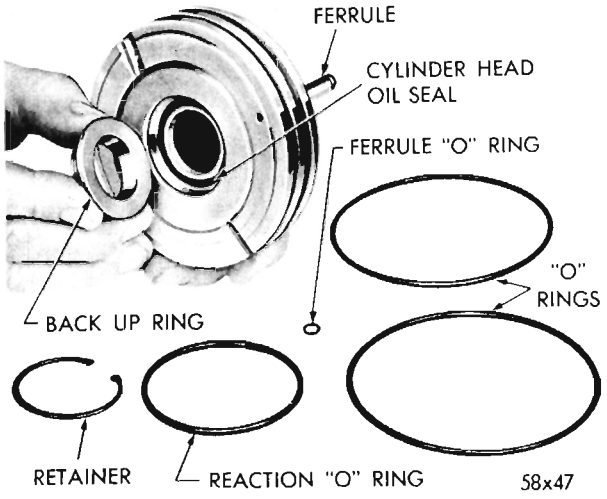


Fig. 19—Removing the Cylinder Head Oil Seal

(17) Test the operation of the worm shaft. The torque required to rotate the wormshaft throughout its travel in or out the piston must not exceed 2 inch pounds.

NOTE: The worm and piston is serviced as a complete assembly and should not be disassembled.

Assembling the Power Train

Discard all "O" seal rings and seals, using new ones lubricated with petrolatum when reassembling. Refer to Figures 1 and 15 for parts identification.

(1) If the power piston ring was removed, inspect the condition of the rubber sealing ring located under the cast iron ring and replace it if necessary. Install the cast iron piston ring as follows:

(a) Slide a new piston ring into place in the piston groove, then place the piston and ring assembly in Tool C-3676 with the lower part of the piston and ring resting on the land of the Tool (Fig. 20).

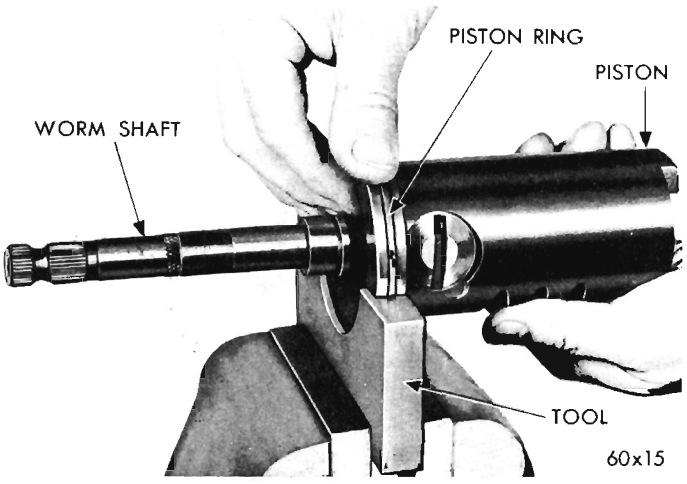


Fig. 20—Installing the Piston Ring

(b) Press down on the piston to bottom the ring in the piston groove, forcing the open ends of the ring out for ease of locking the ring. Ring should be positioned with the ring hooks in line with the ball guide plug.

(2) Place the piston assembly in a vertical position (worm shaft up) in a vise equipped with soft jaws.

(3) Inspect the cylinder head ferrule oil passage for obstructions and the lands for burrs, then lubricate the two large "O" rings and install them in the cylinder head grooves, (Fig. 19).

(4) Install the cylinder head oil seal, back-up ring and retainer (if removed). Make sure the retainer is seated in the groove.

(5) Install the lower reaction seal in the cylinder head groove.

NOTE: The small "O" ring for the ferrule groove should be installed after the worm shaft bearing preload has been established; otherwise, the small "O" ring will be damaged by the reaction springs and center bearing spacer.

(6) Slide the cylinder head assembly (ferrule up) on the worm shaft, test the worm shaft seal ring making sure the gap is closed to avoid damaging the ring as the cylinder head moves against the piston flange.

(7) Lubricate with MoPar Power Steering Fluid, Part No. 2084329 and install the parts in the following order:

(a) Lower thrust bearing race (thick).

(b) Lower thrust bearing.

(c) Lower reaction spring (with the small hole over the ferrule).

(d) Lower reaction ring (flange up so ring protrudes through reaction spring and contacts the reaction "O" ring in the cylinder head).

(e) Center bearing race.

(f) Upper thrust bearing.

(g) Upper thrust bearing race (thin).

(h) Start the worm shaft thrust bearing adjusting nut (do not tighten).

(8) Turn the worm shaft counter-clockwise one-half turn. Hold the worm shaft in this position with the splined nut, Tool C-3637 and socket wrench, then tighten the nut to 50 foot-pounds torque to prestretch the worm shaft threads.

CAUTION: If the worm shaft is turned more than one-half turn, the cylinder head oil seal retainer will clear the oil seal ring on the worm shaft. Always position the worm shaft oil seal ring before bottoming the cylinder head against the piston top flange to avoid damaging the oil seal ring.

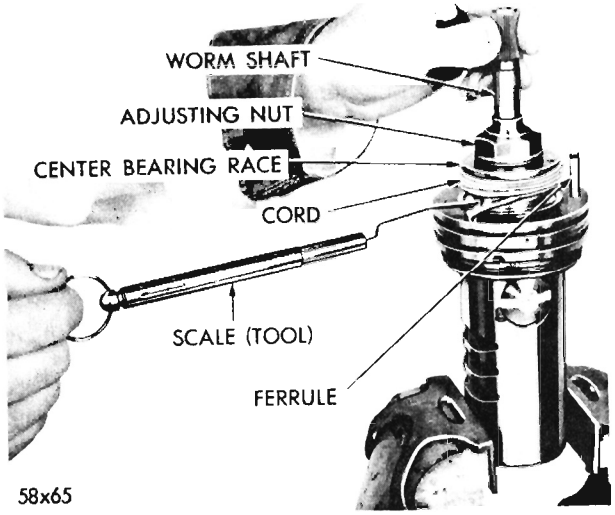


Fig. 21—Checking the Center Bearing Pre-load

(9) Loosen the adjusting nut. Place several rounds of cord around the center bearing race (Fig. 21). Make a loop in one end of the cord and hook the loop of a distributor breaker arm spring scale Tool MTU-36 in the cord loop. Pulling the cord will cause the bearing race to rotate. Retighten the worm bearing adjusting nut while pulling on the cord with the scale. If the adjusting nut is tightened properly, the reading on the scale should be 16 to 24 ounces (20 ounces preferred while the race is turning).

(10) Stake the upper part of the worm shaft adjusting nut into the knurled area of the shaft.

CAUTION: Place a support under the adjusting nut during the staking operation to avoid brinneling the piston and worm bearings.

(a) Hold a ¼ inch flat end punch on the center line of the worm shaft end at a slight angle to the nut flange (Fig. 22).

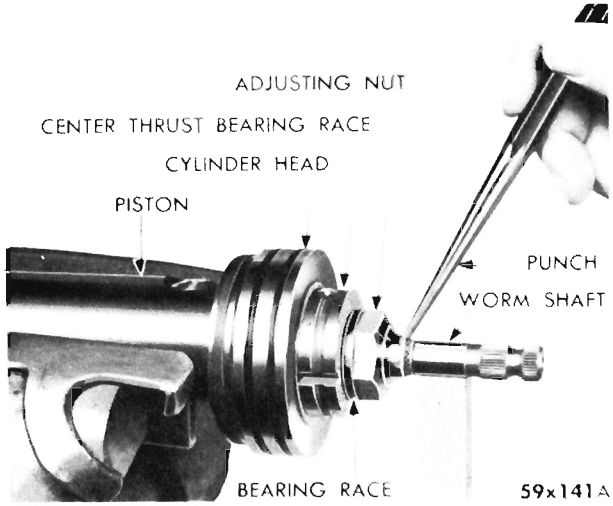


Fig. 22—Staking the Worm Shaft Bearing Adjusting Nut

(b) Strike the punch a sharp blow with a hammer and test pre-load.

NOTE: If the adjusting nut moved during the staking operation, it can be corrected by striking the nut a glancing blow in the direction required to regain proper preload.

(c) After retesting for proper pre-load, stake the nut at three more locations 90° apart around the upper part of the nut.

(d) To test the total staking, torque the nut to 28 foot-pounds torque in either direction. If the nut does not move the staking operation is satisfactory.

IMPORTANT: Retest the pre-load adjustment, the torque of 16 to 24 inch ounces must remain after the adjusting nut is securely locked.

(11) Position the center bearing spacer assembly over the center bearing race, engaging the dowel pin of the center bearing spacer in the slot of the race, and the slot of the center spacer entered over the cylinder head ferrule.

NOTE: This will align the valve pivot lever hole in the center bearing race with the valve pivot lever hole in the center bearing spacer assembly.

(12) Install the upper reaction ring on the center bearing spacer with the flange down against the spacer.

(13) Install the upper reaction pressure spring over the reaction ring with the cylinder head ferrule through the hole in the reaction spring.

(14) Install the worm balancing ring (without flange) inside the upper reaction ring.

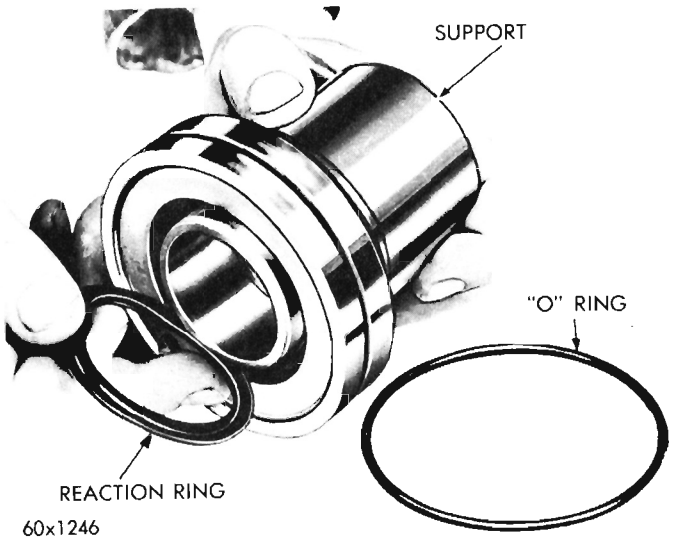


Fig. 23—Installing the Reaction Seal Ring in Worm Shaft Support

(15) Lubricate the ferrule "O" ring with petrolatum and install it in the groove on the cylinder ferrule.

(16) If the oil seal was removed from the worm shaft support, install a new seal with Tool C-3650 (Fig. 9). With the lip of the seal toward the bearing, drive in the seal until the tool bottoms on the support.

(17) Lubricate and install the reaction seal ring in the groove in the face of the worm shaft support with the flat side of seal out (Fig. 23). Install the "O" ring in the groove on the support.

(18) Slide the worm shaft support and arbor, Tool C-3929 over the worm shaft, carefully engaging the cylinder head ferrule and "O" ring and making sure the reaction rings enter the circular groove in the support. Remove the tool arbor when the support is positioned.

(19) Align the parts on the power train so the valve pivot lever hole in the center of the bearing spacer assembly is 90 degrees counter-clockwise from the piston rack teeth in the "up" position to index with the steering valve assembly.

Steering Valve Disassembly

(1) Remove the two screws attaching the control valve body to the steering valve body and separate the two bodies (Fig. 24).

(2) Compress the control valve spring and remove the retainer pin, spring, valve piston and cushion spring.

(3) Carefully shake out the spool valve and inspect the valve for nicks, burrs and scores. Do not remove the valve body end plug unless inspection indicates a leak at the gasket.

NOTE: If the spool valve or valve body is damaged, replace the valve and body assembly.

Small burrs and nicks may be removed with crocus cloth if extreme care is used not to round off the sharp edge portion of the valve. The sharp edge portion is vitally important to the operation of this valve.

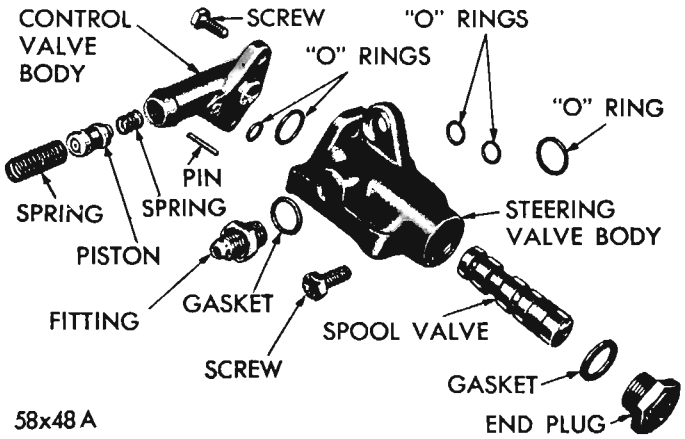


Fig. 24—Valve Body Assembly (Disassembled)

Clean the valve bodies and valve pistons thoroughly in clean solvent. Blow out all passages and blow parts dry with compressed air. Lubricate pistons and bores with Power Steering Fluid Part Number 2084329.

Assembling the Steering Valve

(1) Install the steering spool valve into the valve body so that the valve lever hole is aligned with the lever opening in the valve body. Valve must be perfectly free in the valve body without sticking or binding (Fig. 24).

(2) Install a new gasket on the end plug (if removed). Tighten the plug to 25 foot-pounds torque.

(3) Install the piston cushion spring in the control valve body. Lubricate the piston and insert the nose end of piston into the body bore. Test for smooth operation. Be sure the cushion spring is not cocked.

(4) Install the spring on top of the piston, compress the spring and install the retaining pin.

(5) Position the two new "O" rings on the control valve body and attach the control valve body to the steering valve body. Tighten the two attaching screws to 10 foot-pounds torque.

(6) If the pressure inlet fitting has been removed, replace the copper gasket and retighten the fitting to 30 foot-pounds torque.

Gear Shaft and Needle Bearings

Removal

Refer to Figure 15 for parts identification.

(1) Remove the lock nut from the gear shaft adjusting screw and remove the screw from the cover by turning the screw clockwise. Slide the adjustment screw and shim out of the slot in the end of the gear shaft.

NOTE: The gear shaft cover assembly, including the needle bearing, is serviced as a unit and should be replaced when bearing replacement is necessary.

(2) To remove the gear shaft needle bearings, remove oil seal snap ring with pliers, Tool C-3229 and remove the seal back-up washer.

(3) Insert tool C-3875 in the steering housing; place the housing in a press then press out the bearings and the oil seal.

Installation

(1) To install the gear shaft outer needle bearing,

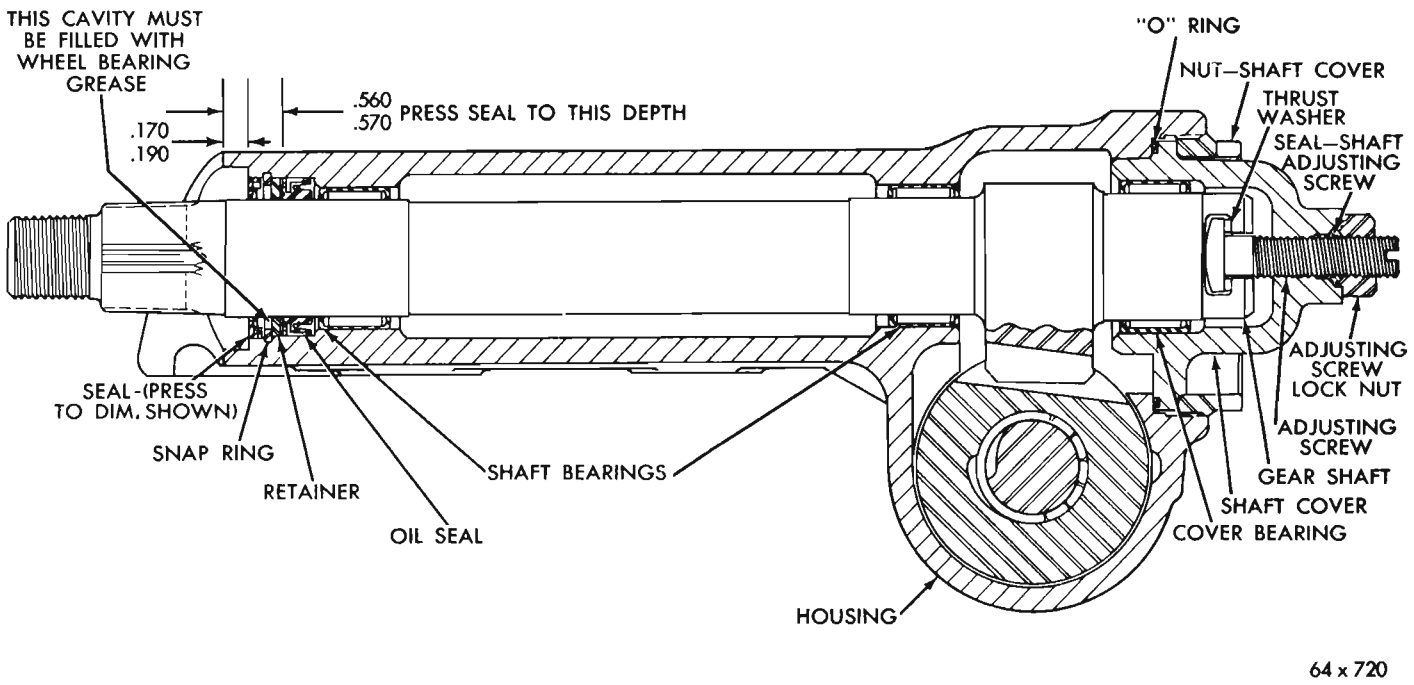


Fig. 25—Steering Gear Housing (Sectional View)

place the bearing on the end of Tool C-3875. Press the bearing into the steering gear housing ¾ inch below the end of the bore to provide space for the oil seal, back-up washer and snap ring and cross shaft grease retainer. See "Gear Shaft Oil Seal Replacement", Paragraph 2.

CAUTION: The arbor adapter ring must be used with the C-3875 Remover and Installer arbor, otherwise the bearings would be crushed.

(2) To install the inner needle bearing, place the bearing on the end of Tool C-3875. Press the bearing into housing flush with the end surface of the bore.

(3) Insert the gear shaft and adjusting screw into the cover and using a screw driver through the threaded hole in the cover, turn the screw counterclockwise to pull the shaft into the cover. Lubricate a new seal ring and slide it over the adjusting screw into position on top of the cover. Install the adjusting screw lock nut, but do not tighten at this time.

(4) Lubricate the "O" ring and gear shaft cover with petrolatum and place the "O" ring in the cover groove (Fig. 25).

Assembling the Steering Gear

(1) With the steering gear housing in the holding fixture in approximate car position; lubricate the bore of the housing with petrolatum and carefully install the power train assembly, with the center bearing spacer valve lever hole in the "UP" position to line up with the control valve lever clearance hole in the steering gear housing.

CAUTION: Make sure the cylinder head is bottomed on the housing shoulder (Figs. 1 and 2).

(2) Align the valve lever hole in the center bearing spacer exactly with the steering valve hole in the gear housing, using the spacer to housing Aligning Tool C-3649. (Fig. 26)

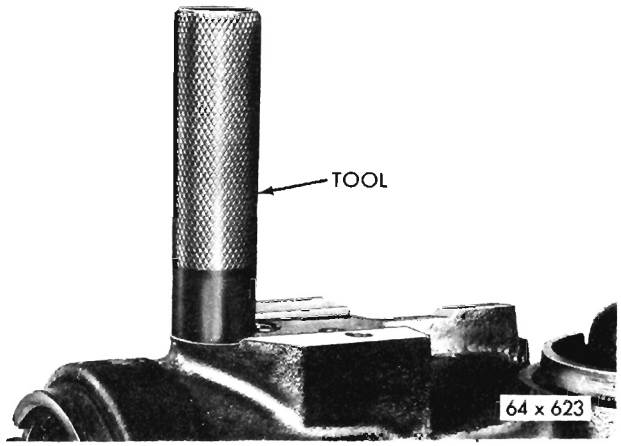


Fig. 26—Aligning the Center Bearing Spacer with the Steering Valve

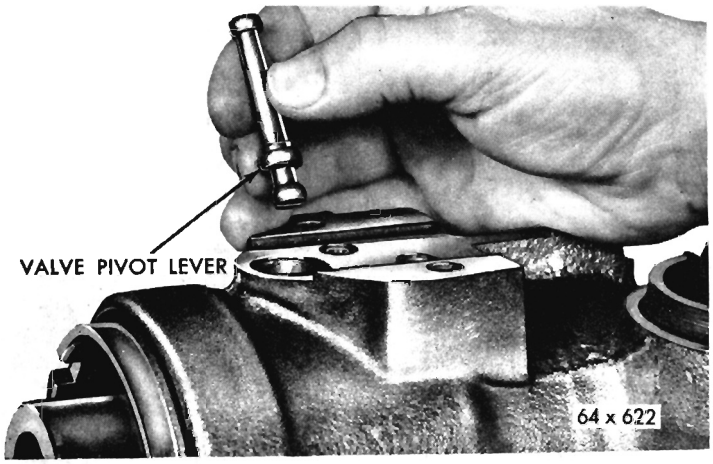


Fig. 27—Installing the Valve Pivot Lever

NOTE: The aligning tool should not be removed until the spanner nut is securely tightened.

(3) Install the power train and worm shaft supporting tang washer and retainer nut. Tighten the nut 110 to 200 foot-pounds torque with Tool C-3634.

(4) Set the power piston at the center of travel and install the gear shaft and cover assembly so that the sector teeth index with the piston rack teeth. Make sure the "O" ring is positioned in the face of the cover (Fig. 25).

(5) Install the cover spanner nut and tighten 110 to 200 foot-pounds torque with Tool C-3633.

(6) Install the valve pivot lever (double bearing end first) (Fig. 27), into the center bearing spacer through the hole in the steering housing so that the slots in the valve lever are parallel to the worm shaft in order to engage the anti-rotation pin in the center bearing race. Install the valve pivot lever spring.

NOTE: Turn the worm until the piston bottoms in both directions and observe the action of the lever. It must return snappily to its center position when the worm torque is relieved.

(7) Install the valve body on the housing making sure the valve pivot lever enters the hole in the valve spool (Fig. 1). Be sure the "O" ring seals are in place. Tighten the valve mounting screws to 7 foot-pounds torque.

(8) Install the new gear shaft inner seal followed by the seal back-up washer and snap ring and a new grease retainer as outlined under "Gear Shaft Oil Seal Replacement", Paragraph 2.

Bench Test and Adjustments

(1) Remove the oil reservoir cover and fill the reservoir Power Steering Fluid 2084329 to the lever mark.

(2) Connect the test hoses C-3211 and C-3318 with proper adaptors to the hydraulic pump on the vehicle with the pressure gauge C-3309B installed between the pump and the steering gear to register pressures.

(3) Start the engine and operate at idle to bring the steering gear to normal operating temperature.

(4) Centralize the steering valve on the gear housing by tapping it up or down, then expel all air from the unit by turning the worm shaft several times to the right and then to the left.

(5) Refill the reservoir before preceeding with the following tests and adjustments on the bench.

(a) Tighten the steering valve body attaching screws to 7 foot-pounds torque.

(b) With the gear shaft on center, tighten the gear shaft adjusting screw until backlash just disappears. If the power train has been disassembled, tighten 1¼ turns from this position and while holding the adjusting screw in this position, tighten the lock nut (Fig. 28).

NOTE: This is a temporary adjustment to bring the piston rack and sector teeth in full alignment.

(c) Turn off the hydraulic power to the unit. Operate the unit manually for a minimum of 180° from center in each direction, measured at the worm shaft.

(d) With the hydraulic power to the gear unit and with the gear shaft on center, readjust the gear shaft backlash. This will require loosening the adjusting screw until backlash is evident. Then retighten the adjusting screw until the backlash just disappears. Continue to tighten for ⅜ to ½ turn from this position and tighten the lock nut to 50 foot-pounds torque to maintain this setting.

(e) Starting from a point at least one full turn of the worm shaft either side of center, the torque at the gear shaft required to turn the unit through

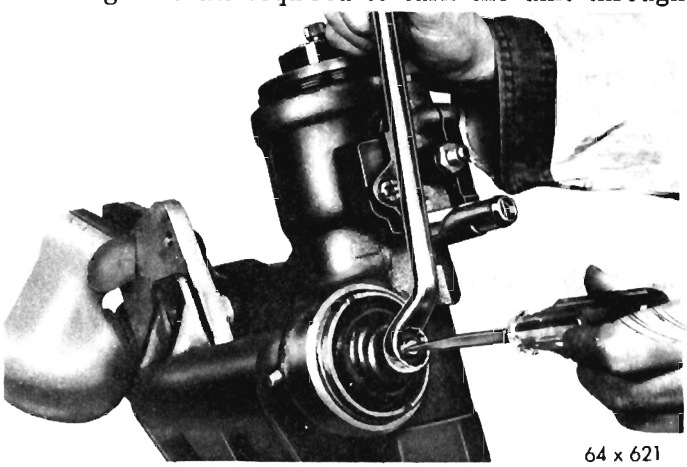


Fig. 28—Adjusting the Steering Gear Mesh

center at 2 rpm in each direction shall not exceed 25 foot-pounds or vary more than 5 foot-pounds from left to right. Perform this operation carefully to prevent a lockup in the steering gear.

(f) Adjust the torque evenly by moving the steering valve assembly by tapping on the back pressure valve body attaching screws to move the valve body up on the steering housing, and tap on the end plug to move the valve body down on the housing.

NOTE: If the torque is greater to the left, move the control valve body down. If the torque is greatest to the right, move the valve body up. After positioning the valve to obtain equal torque, tighten valve body attaching screws to 15 foot-pounds torque to maintain this setting.

(g) With the gear at or near the full turn in either direction, attempt to return the unit to center by applying a torque wrench at the steering gear shaft. Hold the worm shaft until the cross shaft torque builds up to 50 foot-pounds. Release the worm shaft and maintain a constant steady pull on the gear shaft (turning cross shaft slowly). If the cross shaft torque does not drop to 25 foot-pounds torque maximum as the unit passes through center, check for too much interior drag; binding valve lever, binding spool valve, or cross shaft adjustment that is too tight.

(6) With the unit under power, but with no load, the torque required to rotate the worm shaft through an included angle of 180° (90° either side of center) shall be 6-10 inch pounds. Disconnect the test equipment and mounting fixture and install the unit in the vehicle.

Installation of Steering Gear in Vehicle

(1) On vehicles equipped with six cylinder engines, enter the steering gear at the engine compartment. On eight cylinder equipped vehicles, enter the steering gear from below with the gear shaft end of the steering gear first, then roll the gear up into position between the frame and the engine. **DO NOT** damage the automatic transmission oil cooler lines on vehicles so equipped.

(2) Install the steering gear housing retaining bolts and tighten to 50 foot-pounds torque.

(3) Install the starting motor.

(4) Position the steering gear in center of high spot and install the steering gear arm, washer and nut. Tighten nut to 120 foot-pounds torque.

(5) Connect the hydraulic hoses to the steering valve.

(6) Place the front wheels and steering wheel in the straight-ahead position.

(7) Position the clamp on the steering shaft coupling and with the master splines on the worm shaft and notch on the body of the coupling aligned, engage the column coupling with the steering gear worm shaft.

(8) Install the coupling clamp bolt and tighten the bolt to 30 foot-pounds torque.

(9) Position the steering jacket assembly so the steering shaft is centered at the midpoint of up and down travel.

NOTE: A 3/16" gauge hole is provided in the steering column shaft, when the dimension from the top of the coupling to the centerline of the gauge hole is 13/16 inch, the coupling is centered in its travel.

(10) With the coupling centered, tighten the column jacket to the instrument panel clamp bolts to 95 inch-pounds torque.

(11) Connect the negative cable to the battery.

(12) Start the engine, turn the steering wheel to right and left several times to expell the air from the system.

(13) Inspect the power steering pump reservoir level, replenish as necessary.

SERVICE DIAGNOSIS

POWER STEERING GEAR

Condition	Possible Cause	Correction
Hard Steering	(a) Tires not properly inflated.	(a) Inflate the tires to recommended pressures.
	(b) Low oil level in pump reservoir (usually accompanied by pump noise).	(b) See "Fluid Level", Power Steering Pump.
	(c) Loose pump belt.	(c) See "Belt Adjustment".
	(d) Improper caster and camber.	(d) See "Front Wheel Alignment". Front Suspension Section.
	(e) Power steering output low.	(e) Perform the "Pump Pressure and Flow Tests". NOTE: When the power steering pump fails to give proper steering assist, the trouble is usually caused by fouling of the flow control valve causing it to stick in the open or "by-pass" position. This fouling can be caused by gum deposits, pieces of broken slipper springs, burrs, or foreign material (pieces of rubber, dirt or matching chips). If no fouling of the flow control valve is evident, or if the flow control valve contains pieces of coiled wire (broken slipper spring), the pump should be disassembled for possible slipper spring replacement.
	(f) Steering linkage binding.	(f) Repair and lubricate as necessary.
	(g) Steering gear malfunctions. 1. Gear shaft adjustment too tight. 2. Faulty or damaged valve lever. 3. External leakage. 4. Excessive internal leakage.	(g) Adjust or repair as follows: 1. See "Gear Shaft Adjustment". 2. Remove steering gear, repair as necessary. 3. Inspect for leakage at the lower sector shaft oil seal; the sector shaft cover "O". 4. Remove the steering gear and repair as necessary.
Poor Recovery from Turns	(a) Tires not properly inflated.	(a) Inflate the tires to recommended pressures.
	(b) Steering linkage binding.	(b) Repair and lubricate as necessary.
	(c) Improper wheel alignment.	(c) See "Front Wheel Alignment", Front Suspension Section.
	(d) Damaged steering tube bearing.	(d) Remove the jacket tube and replace bearings.
	(e) Steering wheel column jacket and steering nut improperly aligned.	(e) See "Installation of Steering Gear".

SERVICE DIAGNOSIS—(Continued)
POWER STEERING GEAR

Condition	Possible Cause	Correction
Poor Recovery from Turns Continued	(f) Steering gear malfunctions. 1. Improper gear shaft adjustment. 2. Column support spanner nut loose. 3. Damaged valve lever. 4. Improper worm thrust bearing adjustment. 5. Worn or damaged cylinder head worm seal ring or faulty worm piston ring. 6. Burrs or nicks in the reaction ring grooves in the cylinder head or column support. 7. Dirt or chips in the steering gear unit. 8. Rough or catchy worm in the piston assembly.	(f) Adjust or repair as follows: 1. See "Gear Shaft Adjustment". 2. Remove the steering gear, disassemble, inspect and reassemble as outlined in this section. 3. Remove the steering gear and repair as necessary. 4. Remove the steering gear, disassemble, inspect and reassemble. See "Center Bearing Preload", Assembly of Power Train. 5. See "Steering Gear Removal, Disassembly and Inspection", replace parts as necessary. See "Disassembly and Assembly of Power Train". 6. Remove the steering gear and repair as necessary. 7. Remove the steering gear, disassemble completely, clean in a clean solvent, inspect and make repairs as necessary. 8. Replace the worm and piston assembly. See "Steering Gear Removal, Disassembly, Inspection and Reassembly".
Car Leads to Either Side	(a) Tires not properly inflated. (b) Improper wheel alignment. (c) Valve body out of adjustment. (d) Valve lever damaged. (e) Column support spanner nut loose.	(a) Inflate the tires to recommended pressures; See "Wheels and Tires". (b) See "Front Suspension, Front Wheel Alignment". (c) If vehicle leads to the left, move the steering valve housing **down** on the steering housing. If vehicle leads to the right, move the steering valve housing **up** on the steering housing. (d) Remove the steering gear and replace or repair as necessary. (e) Remove the steering gear and repair as necessary.
Excessive Steering Wheel Free-Play	(a) Improper gear shaft adjustment. (b) Column support spanner nut loose. (c) Improper worm thrust bearing adjustment. (d) Coupling loose on the worm shaft.	(a) See "Gear Shaft Adjustment". (b) Remove the steering gear, disassemble, inspect, and reassemble. (c) Remove the steering gear, disassemble, inspect and reassemble, see "Center Bearing Preload Assembly of Power Train". (d) Inspect the wormshaft splines for wear.

SERVICE DIAGNOSIS—(Continued)

POWER STEERING GEAR

Condition	Possible Cause	Correction
Lack of Assist 1. (One Direction)	(a) Oil leaking past worm shaft oil seal ring.	(a) Remove the steering gear, disassemble, inspect and replace the parts as necessary.
	(b) Broken or worn ring on worm piston.	(b) See "Assembly of the Power Train".
	(c) Piston end plug loose.	(c) Replace the worm and piston assembly.
	(d) Reaction seal missing.	(d) Remove the steering gear and repair as necessary.
Lack of Assist (Both Directions)	(a) Pump belt slipping.	(a) See "Pump Belt Adjustment".
	(b) Pump output low.	(b) Perform the "Pump Pressure and Flow Tests", also refer to correction (e) in Diagnosis under "Hard Steering".
	(c) Broken or worn ring on worm piston.	(c) See "Assembly of Power Train".
	(d) Piston end plug loose.	(d) Replace the worm and piston assembly.
	(e) Internal leakage in the steering gear valve body.	(e) Replace the steering gear valve body assembly.
Temporary Increases in Effort When Turning Steering Wheel to the Right or Left	(a) Oil level low in pump reservoir.	(a) See "Fluid Level".
	(b) Loose pump belts.	(b) See "Pump Belt Adjustment".
	(c) Oil on pump belt.	(c) Replace the belt and adjust.
	(d) Binding steering linkage.	(d) Lubricate and repair as necessary.
	(e) Engine idle too slow.	(e) See "Fuel Specifications".
	(f) Air in the system.	(f) Work the steering wheel from right to left until the air is expelled.
	(g) Power steering pump output low.	(g) See Diagnosis "Hard Steering" correction (e).
	(h) Gear malfunction.	(h) Adjust and repair as outlined under "Hard Steering"—condition and correction (g).
Noises	(a) Buzzing noise in neutral and stops when the steering wheel is turned.	(a) Noisy pump, make pressure test and repair as necessary. Damaged hydraulic lines or interference of the hoses with components attached to the fender shield. Air in system; work steering wheel from right to left until the air is expelled.

SERVICE DIAGNOSIS—(Continued)

POWER STEERING GEAR

Condition	Possible Cause	Correction
Noises-Continued	(b) Chuckling noise. Causes as follows: 1. Improper gear shaft adjustment. 2. Improper worm shaft thrust bearing adjustment. 3. Coupling loose on the worm shaft. 4. Worn worm and piston assembly.	(b) Correct as follows: 1. See "Gear Shaft Adjustment". 2. Remove steering gear, disassemble, inspect and reassemble. See "Center Bearing Preload". 3. Inspect worm shaft splines for wear. Also inspect retaining pin for tightness. 4. Replace worm and piston assembly.
	(c) Metallic clatter or tapping noise.	(c) Replace the back pressure valve cushion.
	(d) Knocking condition at the bracket stop when the engine is running.	(d) Rubber stop worn or missing from pump bracket.
	(e) Loose pump belt.	(e) Belt not properly adjusted or worn to the extent that belt tension cannot be properly adjusted.

PART 4

POWER STEERING PUMP

1. OPERATION

The slipper type power steering pump is a belt-driven constant displacement pump.

In operation (Fig. 1) the spring-loaded slippers in the pump rotor are in contact with the eccentric, inside diameter of the housing. As the rotor revolves the slippers forces the oil from the inlet side of the pump to the flow control valve. Orifices in the metering insert permit a flow of approximately two gallons per minute to the gear before the valve moves to the lift to allow the excess to flow back to the inlet side of the pump. Maximum pressure in the system is limited by the pressure relief valve. The valve opens into the reservoir when the pressure exceeds the maximum pressure specified.

SERVICE PROCEDURES

2. MEASURING FLUID LEVEL

(1) Start the engine, turn the steering wheel back and forth several times to expel the air from the system, then shut off engine.

(2) Remove the filler cap and visually check the oil level in the reservoir:

Engine Cold—Oil level should be at the bottom of filler neck.

Engine Hot—Oil level should be one-half way up in fill neck.

If necessary, add only 2084329 Power Steering Fluid to the required level. Do not overfill.

3. PRESSURE TEST

(1) Test pump belt tension. See "Cooling System", Group 7.

(2) Disconnect the pump to the steering gear pressure hose at the power steering pump. Connect the test hose C-3388 with the proper adapter between power steering pump and pressure gauge C-3309B with the shut-off valve between the pressure gauge and the pressure hose that you disconnected from the pump. (Fig. 2). **Make sure all connections are tight and that the shut-off valve is fully opened.**

NOTE: The pressure gauge must be installed between the pump and the shut-off valve, all connec-

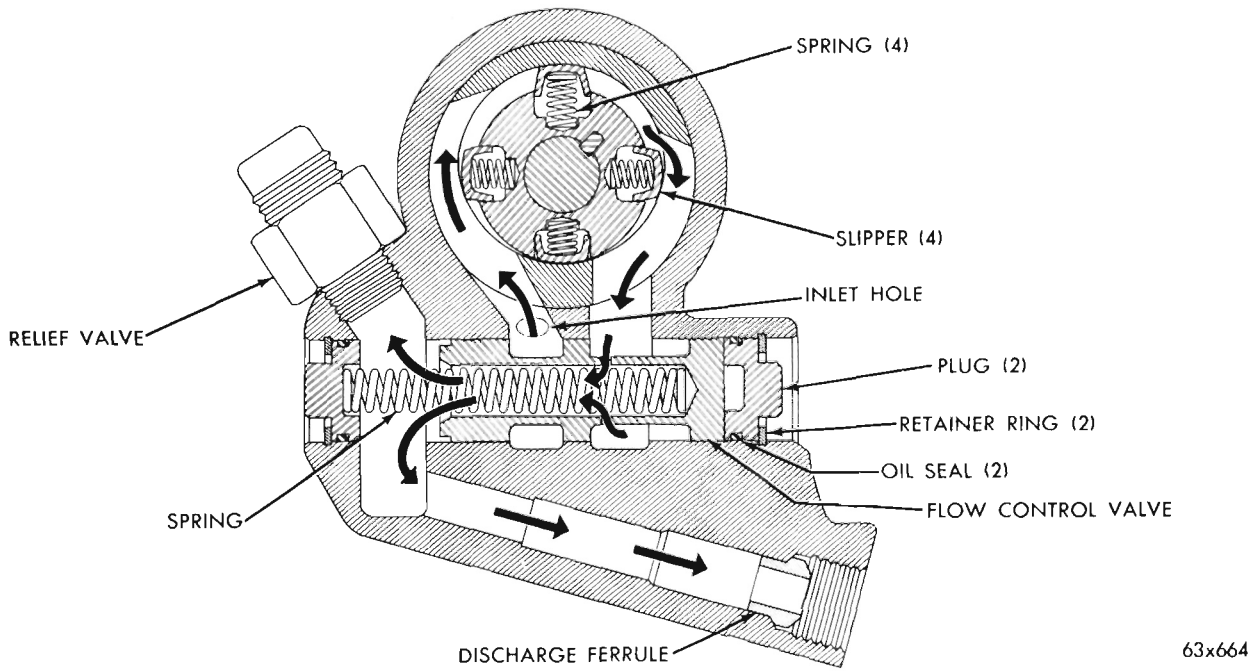


Fig. 1—Power Steering Pump (Schematic)

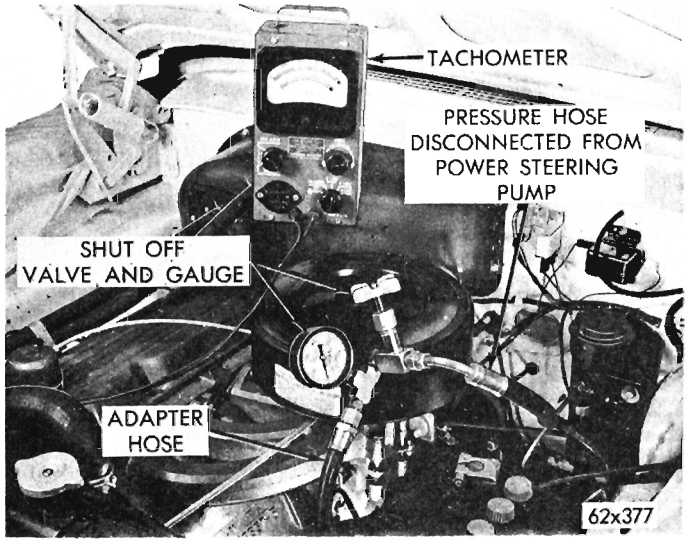


Fig. 2—Pressure Test (Typical)

tions must be tight and shut-off valve full open.

(3) Remove the pump reservoir filler cap.

(4) Connect one lead of the tachometer to the distributor terminal of coil, the other lead to a good ground, start the engine and operate at 500 rpm and fill pump reservoir to the proper level.

(5) Expel all air from the unit by turning the steering wheel to the full right turn and back to the full left turn several times and recheck oil level.

NOTE: To assist in heating the pump oil: slowly turn the pressure gauge valve towards the closed position until gauge reads 400 psi and open valve fully when oil temperature reached 150 degrees F.

(6) With the engine operating at idle speed (500 rpm) and no steering effort applied, and oil temperature between 150 degrees F. and 170 degrees F. test with a thermometer in reservoir, as shown in Figure 3; the pressure gauge should show a pressure of less than 100 psi. If the pressure is higher, inspect the hoses and connections for kinks and obstructions, or restrictions in the steering gear.

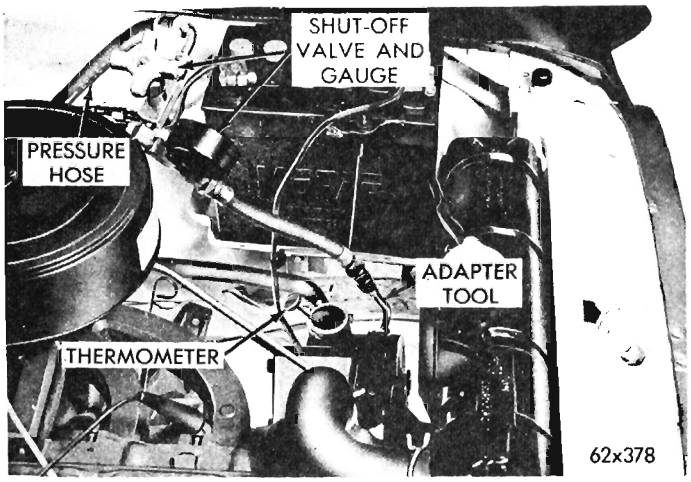


Fig. 3—Testing the Oil Temperature in the Pump Reservoir

(7) Increase the engine speed to 1000 rpm, then slowly close the gauge shut-off valve. With the gauge shut-off valve fully closed the pump pressure should be as shown in "Specifications".

CAUTION: Do not close the valve for more than a few seconds, as this would abnormally increase the oil temperature and cause undue oil pump wear.

(8) If the pressure exceeds the maximum shown in the "Specifications", the relief valve is faulty or the pump is equipped with the wrong relief valve.

(9) If the pressure is less than the minimum shown in "Specifications", the relief valve is defective. Replace the relief valve with the correct relief valve known to be in working order and repeat test. Now if the pressures are below the minimum shown in the pressure chart, disassemble the pump and inspect the flow control valve for evidence of fouling, or slipper spring breakage.

(10) With the gauge shut-off valve fully open, operate the steering unit through another cycle, this time holding the unit at extreme travel in each direction while watching the oil pressure gauge. The gauge reading should be equal in each direction. If not, it indicates excessive internal leakage in the steering gear unit.

NOTE: Do not hold the worm shaft at either extreme position for more than a few seconds.

(11) If the pressures are within the ranges specified under "Specifications," make a flow test as outlined in Paragraph 4.

4. PUMP FLOW TEST

(1) Test the pump belt tension. See "Cooling System", Group 7.

(2) Disconnect the pump pressure hose at the power steering pump and connect the test hose adapter tube and pressure gauge C-3309B with the proper adapters between the power steering pump and the hose disconnected from the pump (refer to Fig. 1).

NOTE: The pressure gauge must be installed between the pump and the shut-off valve, all connections must be tight and the shut-off valve fully open.

(3) Disconnect the return hose at the power steering pump. **Remove return hose screen, be sure screen is cleaned and reinstalled after tests.**

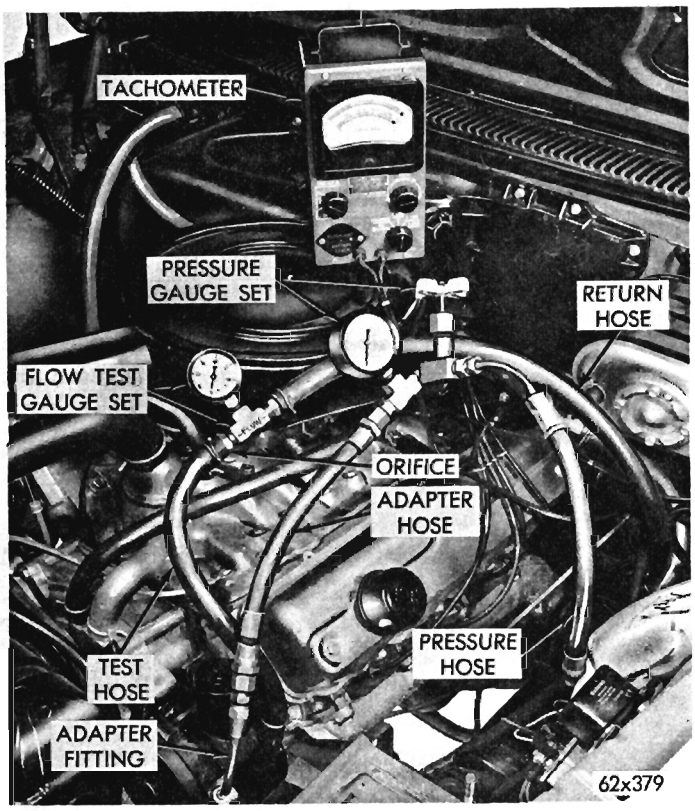


Fig. 4—Flow Test Gauge Connections

(4) Install the flow checking gauge set Tool C-3885 with special hose between the power steering pump and the return hose disconnected from the pump, as shown in Figure 4.

NOTE: The fitting that has the restriction; and the arrow on the "tee" connector (Fig. 4) must be towards the power steering pump.

(5) Remove the oil reservoir cover and fill reservoir to the proper level.

(6) Start the engine and operate at 500 engine rpm.

(7) Expel all air from the unit by turning the steering wheel to the full right turn and back to the full left turn several times.

(8) Increase the engine speed 1000 to 1200 rpm and with no steering effort applied, oil temperature between 150 degrees F. and 170 degrees F. (check the thermometer in reservoir), the flow pressure gauge in the pump return line should read between 14 psi and 25 psi. If the correct checking orifice is used for the test and the flow pressure gauge registers less than 14 psi, inspect to see if the restrictor is installed properly, and if it is installed properly, dirt may be restricting control valve movement or blocking the orifice or flow valve spring may be weak. If the return pressure is greater than 25 psi, the flow valve may be stuck in the closed position.

(9) Decrease the engine speed to 500 rpm, then slowly turn the pressure gauge shut-off valve towards the closed position to obtain the following pressure readings on pressure gauge at the pump discharge without fully closing shut-off valve.

CAUTION: Do not close valve completely.

Valiant 170-225 Cu. In. Engines	600 psi
Plymouth 6 and 8 Cylinder Engines	750 psi

With the above values registered on the pressure gauge the flow checking gauge should show a minimum pressure of 10 psi. If the flow pressure reading is less than 10 psi; test the flow valve operation for sticking; if the valve operation is satisfactory the pump is worn and should be replaced.

If the flow pressure reading is 10 psi or greater, and the relief valve is operating properly; the pump is good.

When removing the test equipment, make sure the pressure and return hoses are reinstalled properly. There should be no interference of the hoses with components attached to the fender shield or dash panel.

NOTE: The return hose screen should be cleaned and reinstalled in the end of the return hose before reinstalling the return hose.

5. POWER STEERING PUMP

Removal

(1) Loosen the pump lower mounting bolt and remove the belt from the pulley.

(2) Place a container under the pump and disconnect both hoses at the pump. Cap ends of hoses and secure hoses high enough to prevent loss of fluid.

(3) Remove the bolts attaching the bracket to the engine and remove the pump and bracket assembly.

Oil Seal Replacement

Removal

(1) Remove the power steering pump from the engine.

(2) Clean the exterior of the pump before disassembly.

(3) Remove the filler cap and drain the reservoir.

(4) Remove the brackets, reservoir screws gasket and "O" ring.

(5) Using spacer washers between the front bracket and the pump, reinstall the front-bracket for use as a holding fixture. Clamp the bracket in a vise (Fig. 5).

(6) Remove the pulley with Tool C-3934 or C-3615 as follows:

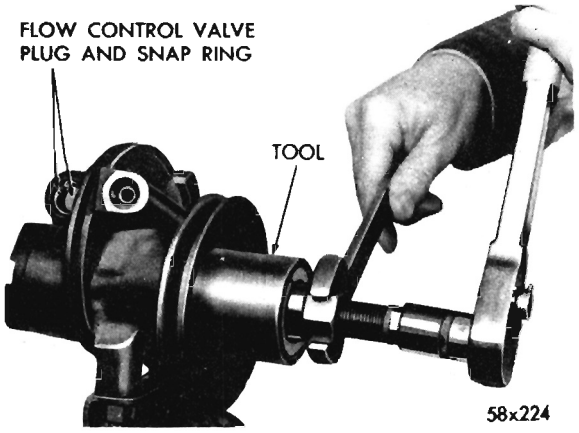


Fig. 5—Removing the Pump Pulley

(a) Engage one half-collar under the flange of the pulley hub.

(b) Position the screw shaft and nut with the flange section inside the half-collar.

(c) Engage the other half-collar under the pulley hub and over the flange of the screw shaft nut and install the retainer sleeve over both half-collars.

(d) Hold the nut from turning and turn the tool screw.

(e) If there is evidence of an oil leak, remove pump shaft oil seal by threading Tool C-3642 far enough into seal to engage the metal portion of the seal, as shown in Figure 6. Turning puller center screw while holding tool body will withdraw the seal assembly from the pump.

Installation

CAUTION: The pulley end of the shaft should be examined for sharp burrs or corners and smoothed with a stone or fine emery cloth. This will prevent seal damage when the new seal is installed. Do not stone or emery the area on the shaft that the lip seal contacts.

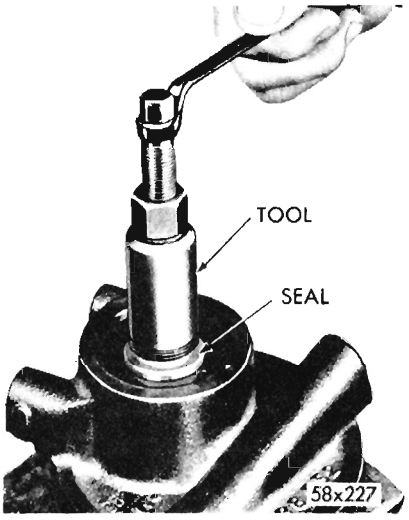


Fig. 6—Removing Pump Shaft Oil Seal

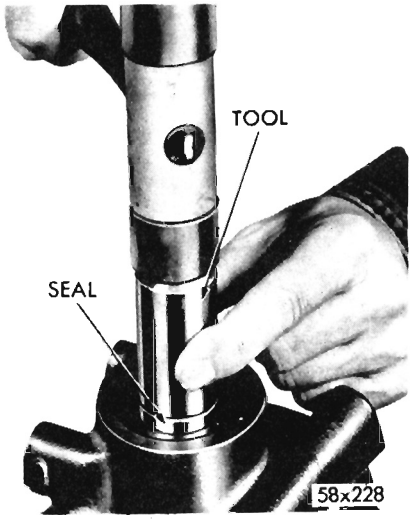


Fig. 7—Installing the Pump Oil Seal

(1) Install the new seal with the lip of the seal toward the pump. Use Tool C-3640 to drive the seal flush with the insert (Fig. 7).

(2) Support the pump body on the holding fixture, Tool C-3643, with the tool dowel pins in the pump bolt holes so that the pressure will be absorbed by the lower end of the pump shaft (Fig. 8).

CAUTION: The pump must be supported in a manner in which all pressing force will be applied to the shaft only; otherwise, the pump body and rotor will be damaged.

(3) Install the pulley with a heavy duty arbor press. Press on the pulley hub only until the hub is flush with the end of the pump shaft.

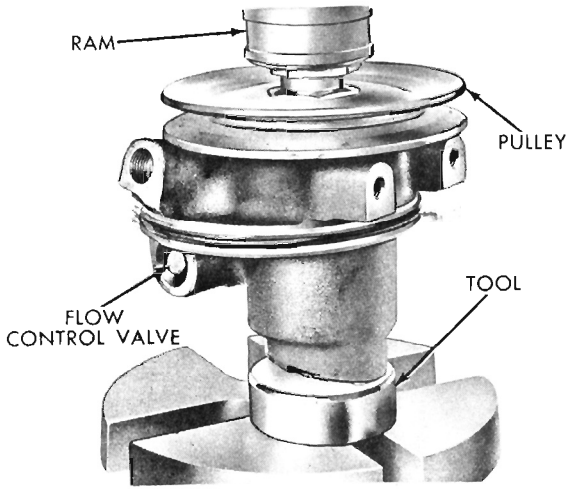


Fig. 8—Installing the Pump Pulley

(4) Lubricate the large "O" ring and the reservoir cap screw gasket and install both on the pump body.

(5) Install the reservoir and the pump brackets. Tighten the screws to 16 foot-pounds torque.

(6) Install the pump steering pump and test belt adjustment as outlined under "Cooling System," Group 7.

6. POWER STEERING PUMP DISCHARGE FITTING FERRULE REPLACEMENT

(1) Wipe away all dirt around the discharge fitting and tighten the high pressure hose tube nut to 24 foot-pounds torque.

(2) Restart the engine and turn steering gear from stop to stop to build up pressure.

If the discharge fitting is leaking, disconnect the high pressure hose at the pump and examine the tubing flare for nicks, scratches, or other damage. If the tubing flare or nut is damaged, replace the high pressure hose.

(3) Examine the pump housing in the discharge area to be sure that the housing has not been damaged by cross-threading or over-tightening the flare nut. If the housing is cracked or if the threads are damaged; the pump must be replaced.

(4) Examine the brass ferrule in the pump discharge fitting for nicks and scratches. The hose tubing flare should make an indentation in the ferrule which is concentric with the center hole and of approximate uniform depth all the way around. If the ferrule is damaged or not seated properly, replace it as follows:

(a) Remove the pump from the vehicle.

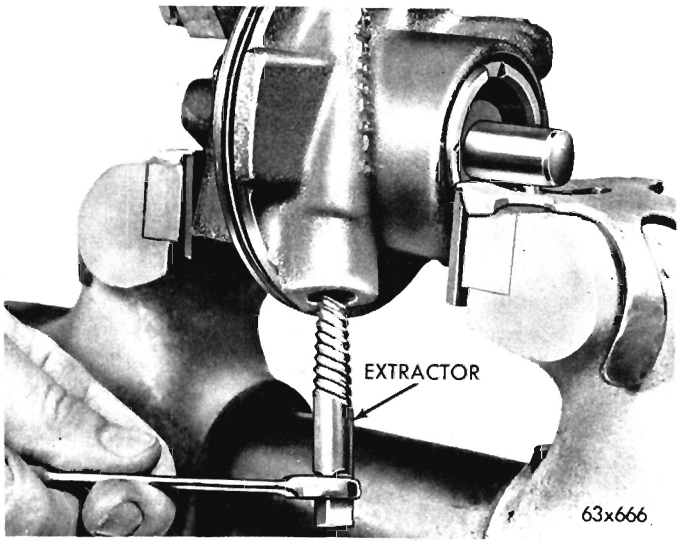


Fig. 9—Installing Ferrule Extractor

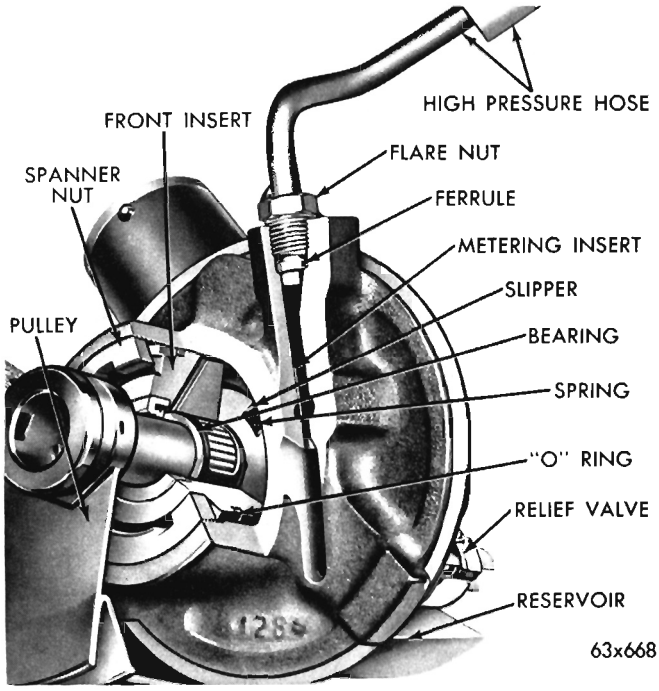


Fig. 10—Pump Cut-Away View (Typical)

opening in the down position, this will prevent any chips from falling into the pump.

(c) Use a No. 4 screw-extractor (E-Z Out). Turn the extractor into the ferrule (Fig. 9). Then rock the extractor slightly to remove the ferrule. Perform this operation carefully so as not to damage the threads on the housing.

(d) Clean out the discharge bore of any foreign material (brass chips, dirt etc.).

(e) Center the new ferrule with the tapered end up in the housing bore. The ferrule is pressed into place by the high pressure hose and tightening the flare nut to 24 foot-pounds torque. Figure 10 is a cutaway view to show the ferrule properly seated in the housing.

CAUTION: Be sure that the ferrule is centered in the housing bore before reinstalling the high pressure hose flare nut.

7. FLOW CONTROL VALVE REPLACEMENT

(1) With the pump reservoir removed, remove one of the flow control valve end plug retaining rings and end plug (Fig. 11).

(2) Depress the control valve against spring pressure and allow it to spring back. The valve should pop out of the bore to a point where it can be removed. If the valve should stick, **do not force it,** but repeat the spring back procedure several times.

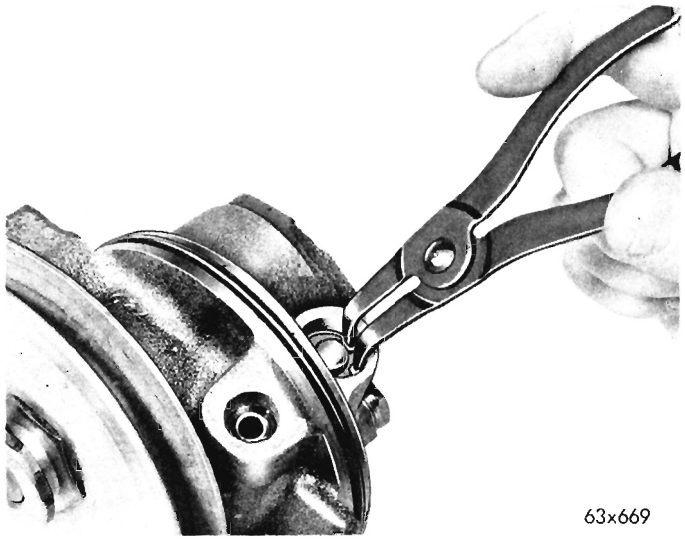


Fig. 11—Removing Flow Control Valve Retaining Ring

NOTE: Gum deposits will cause the control valve to stick in one position and it will be necessary to break the valve free by light tapping and repeat step 2. If the control valve and bore were fouled by gumming, foreign material, or burrs, the valve and valve bore should be thoroughly cleaned and flushed and reassembled.

NOTE: Inspect the flow control valve and valve bore. If the valve or valve bore in pump body are badly scored, replace the pump assembly less pulley and reservoir.

(3) Install the control valve spring, seating the spring in the spring socket.

(4) Remove any burrs with a fine hone or crocus cloth but **Do Not** round the valve land corners.

(5) Lubricate with Mopar power steering fluid Part No. 2084329, and install the control valve over the control valve spring and into the bore. When all valve lands have cleared the retaining ring groove area, work the control valve back and forth against spring pressure until the valve operates smooth and freely.

(6) Install a new "O" ring on the end plug.

(7) Lubricate the end plug and "O" ring and install the end plug with the machined projection **out.**

(8) Install the plug retainer ring with the sharp edge of ring **up.**

(9) Install the relief valve.

(10) Install the pulley (Fig. 8).

(11) Install a new pump body "O" ring, new reservoir gasket and reservoir and brackets.

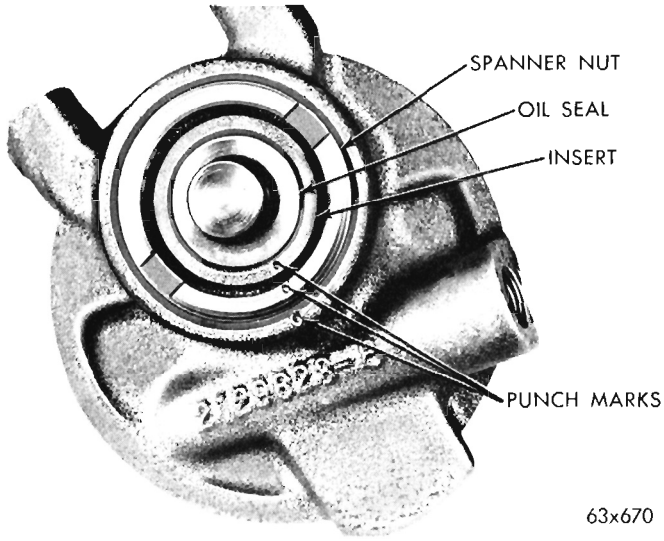


Fig. 12—Center Punch Marks on the Pump Body, Spanner Nut and the Front Insert

8. SLIPPER SPRING REPLACEMENT

(1) Remove the pump and bracket from the vehicle.

(2) Remove the bracket and reservoir.

(3) Remove the pump pulley (Fig. 5).

(4) Use a center punch to mark the position of the front insert and spanner nut in the pump housing (Fig. 12), to insure that the front insert and spanner nut are returned to the exact same position at reassembly.

(5) Use a ¼ inch drift to loosen and remove the spanner nut (Fig. 13).



Fig. 13—Removing the Spanner Nut

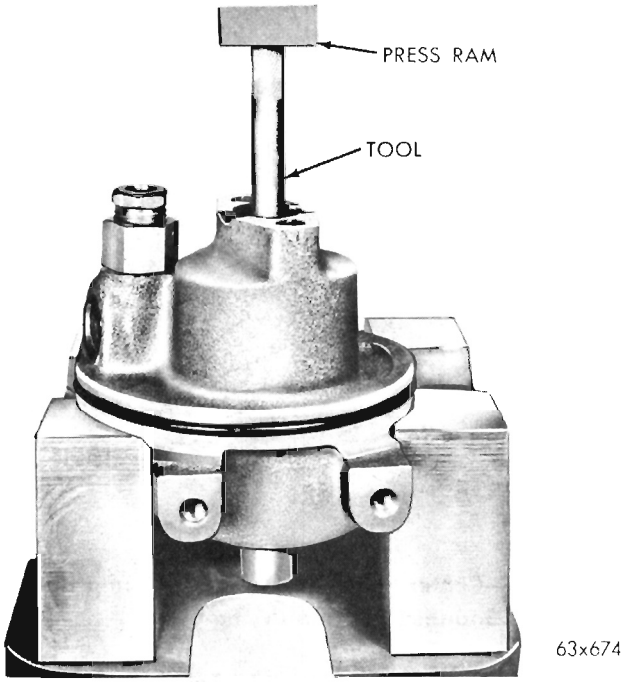


Fig. 14—Removing the Shaft, Rotor and the Front Insert

(6) Support the pump housing so that the front insert is clear of press and using a smooth ½ inch diameter bar (Fig. 14), press the shaft, rotor and front insert out of the pump housing.

CAUTION: Be careful not to damage the pump rear bearing.

(7) Examine the parts for broken edges or deep scoring, especially on the rotor and slippers. If either of these conditions are present, then the pump assembly less relief valve, pulley, and reservoir must be replaced. Small nicks or burrs may be smoothed with a fine hone.

NOTE: The cam insert has two machined notches (one large and one small) on the inside surface; these are not to be interpreted as deep scoring.

(8) Smooth off burrs or corners on the pulley end of the pump shaft, this will prevent shaft oil seal damage when a new seal is installed.

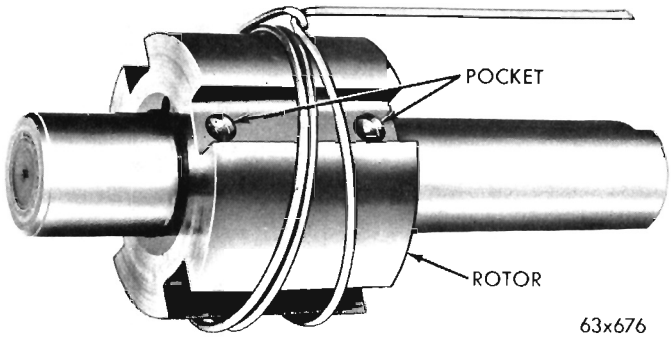


Fig. 15—Slipper Retainer Wire Retainer Tool Installed on Rotor

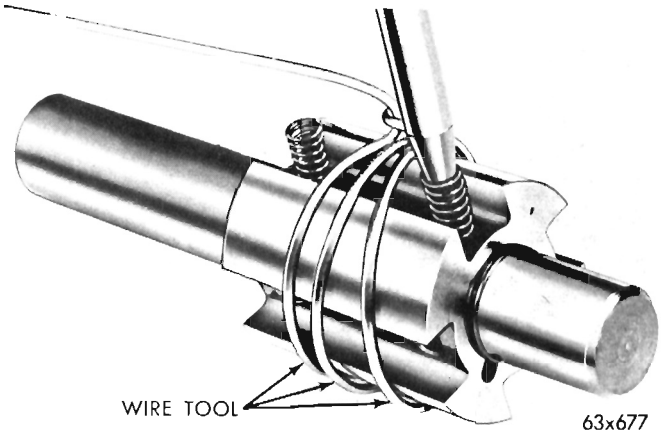


Fig. 16—Installing the Slipper Springs (Typical)

CAUTION: Do not stone or emery the area on the shaft that the seal lip contacts.

(9) If all parts are in a serviceable condition, discard all eight slipper springs even if they appear to be in good condition.

(10) Thoroughly flush and clean all parts with **clean** solvent.

NOTE: It is essential that cleanliness be observed throughout the pump assembly.

(11) Using a piece of wire 25 inches long, make three turns around the center of the rotor and fasten the wire as shown in Figure 15. Bend the ends of the wire towards the pulley end of shaft. Do not make the wire coils too tight or the wire will be difficult to remove.

CAUTION: Use care when handling the rotor and shaft since the corners of the rotor are extremely sharp and must remain sharp for good pump operation. The oil seal and bearing surfaces of the shaft must remain free of any nicks and burrs.

(12) Use an ordinary wood pencil with the point broken to install the new springs. Enter the blunt tapered end of the pencil in the spring and snap the springs into the pockets in the rotor by turning the pencil clockwise (Fig. 16). Install the springs and slippers in one rotor slot at a time. Remove the pencil from the spring with a counter-clockwise rotation. Either end of the spring may be inserted into the rotor pocket.

NOTE: Make sure the proper springs are installed.

(13) Install each slipper by sliding the slipper between the two springs and the wire tool so that the ends are flush with the rotor. The notched portion

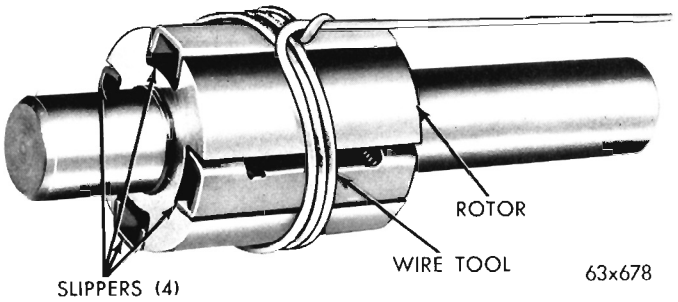


Fig. 17—Slippers Installed on the Rotor

of the slipper must be installed, as shown in Figure 17.

NOTE: Inspect the springs to make sure they are in the pockets and in an upright position under the slipper (Fig. 18).

(14) Using a washer of the dimensions shown in Figure 19 drop it over the pulley end of the shaft. This washer is used to keep the slippers flush with the end of the rotor.

NOTE: It is important that the slippers remain flush with the end of the rotor throughout the assembly operation.

(15) Insert the shaft and rotor assembly with the flat washer tool and slipper retaining wire tool into the pump cam insert so that the slippers and rotor are inside the cam with the end of the shaft resting against the back face in the housing (Fig. 20).

CAUTION: Do not attempt to insert the pump shaft into the bearing at this time.

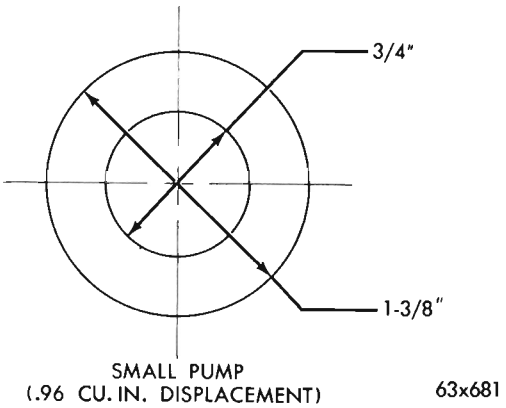


Fig 19—Slipper Retainer Washer Tool

(16) Hold the washer against the rotor with a screw driver while removing the wire retaining tool, making sure that the slippers remain flush with the end of the rotor.

(17) Line the pump shaft with the lower bearing and push the shaft, rotor and slippers all the way into the cam insert.

NOTE: The slipper ends may hang up on the center openings in the cam insert. If this should occur, rotate the shaft while installing to overcome this condition.

(18) Remove the special flat washer tool. Make sure that the springs are in place by rotating the pump shaft and looking through the notch in each slipper.

(19) Lubricate the rotor and slippers with clean power steering fluid and rotate the shaft to make sure the slippers do not bind.

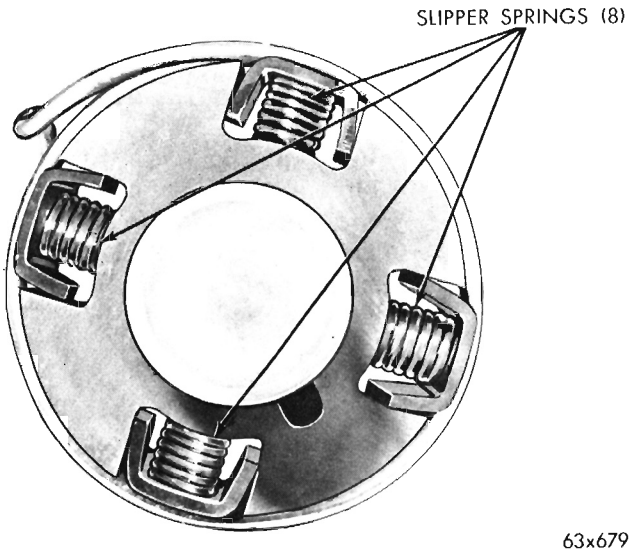


Fig. 18—Slippers & Springs Installed in the Rotor

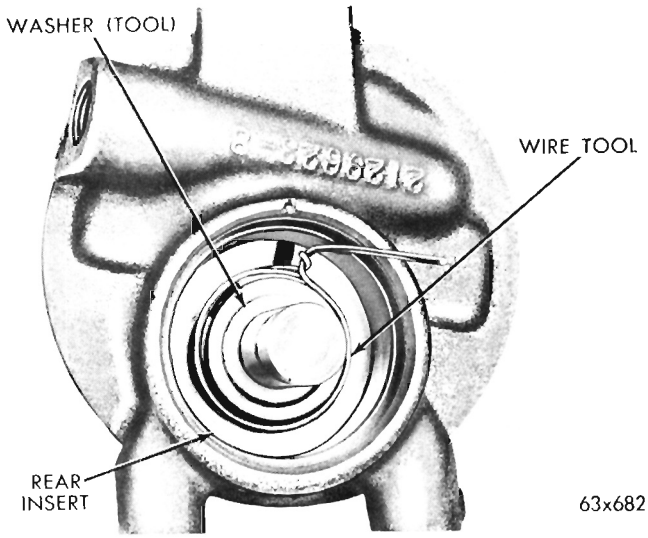


Fig. 20—Installing the Shaft & Rotor Assembly

(20) Replace the shaft seal and "O" ring seal on the front insert. Lubricate the shaft seal, "O" ring and shaft with power steering fluid.

(21) After making sure the inner face on the front insert is smooth and free of burrs, place the insert assembly on the shaft with care so that the shaft seal is not damaged by the end of the shaft.

(22) Support the pump housing in an arbor press (Fig. 21), and using a 1¼ inch socket with a ½ inch drive, align the center punch marks on the front insert and the pump body, and press the insert into the pump housing.

(23) Install the spanner nut and use a ¼ inch drift to tighten to the exact original position in the housing as indicated by the pin punch marks placed on the pump body and spanner nut at disassembly.

(24) Install the flow control valve as outlined under "Flow Control Valve Installation", Paragraph 7.

(25) Install the pump pulley (Fig. 8).

(26) Install a new "O" ring on the pump body and install the reservoir and pump brackets.

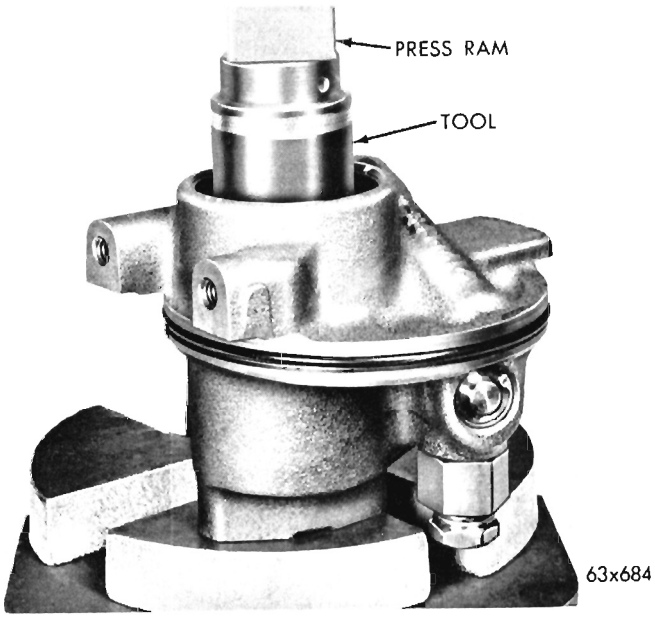


Fig. 21—Pressing the Front Insert into Pump Housing

9. INSTALLING THE POWER STEERING PUMP

(1) Position the pump and bracket on the engine and install the attaching bolts.

(2) Install the drive belts and adjust. See "Belt Adjustment", "Cooling System" Group 7. Tighten the pump bracket bolts to 30 foot-pounds torque.

(3) Connect the pressure and return hoses.

(4) Fill the pump reservoir with Number 2084329 Power Steering Fluid, see "Checking Fluid Level".

(5) Start the engine, turn the steering wheel all the way to the left and back all the way to the right several times to expel the air from the system, then turn off the ignition switch to stop engine and recheck fluid level in reservoir.

SERVICE DIAGNOSIS

POWER STEERING PUMP

Condition	Possible Cause	Correction
Low Oil Pump Pressure	(a) Pump belt loose.	(a) See "Pump Belt Adjustment".
	(b) Pump pulley loose.	(b) Replace the pulley, measure the pump diameters as follows: Shaft diameter .8120-.8125 Pulley inside diameter .8095-.8105. If shaft is damaged, replace pump.
	(c) Oil level low in pump reservoir.	(c) See "Fluid Level".
	(d) Pressure relief valve spring weak, or relief valve stuck in open position.	(d) Replace the relief valve and perform "Pump Pressure Test".
	(e) Flow control valve stuck.	(e) Repair as necessary. Refer to "Flow Control Valve Removal and Installation".
	(f) Worn pump rotor, slippers, or broken and distorted springs.	(f) Repair as necessary. See "Hard Steering" Correction (e).

SERVICE DIAGNOSIS—(Continued)

POWER STEERING PUMP

Condition	Possible Cause	Correction
High Pump Pressure	(a) Wrong relief valve.	(a) Replace relief valve and perform "Pump Pressure Test".
	(b) Relief valve clogged with foreign matter (dirt, metal chips, etc.).	(b) Replace relief valve and perform "Pump Pressure Test".
Leaks	(a) Reservoir over-filled. NOTE: Operating the steering gear manually when the engine is not running will cause the steering gear to displace the fluid from the steering gear housing which will then be forced out of the pump filler cap vent, giving a false indication of fluid leakage.	(a) See "Fluid Level".
	(b) Pressure and return hose connections and fittings.	(b) Tighten all fittings, check hose for deterioration: replace any faulty hoses. If the discharge fitting is leaking; See "Power Steering Pump Discharge Fitting Ferrule Replacement".
	(c) Reservoir to-pump-body "O" ring or mounting screws.	(c) Replace the reservoir "O" ring and tighten reservoir mounting screws.
	(d) Pump shaft oil seal.	(d) Replace oil seal.

GROUP 21
TRANSMISSION
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Manual Transmission 24

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SPECIFICATIONS

3-SPEED MANUAL TRANSMISSION

Model Application	Valiant VV-1	Plymouth VP-1 Taxi/Police			Plymouth VP-2
Engine Displacement (Cu. In.)	170-225	225 H.D.		318 H.D.	361-383 H.D.
RATIO					
First	3.22	2.95	2.95	3.02	3.02	2.55
Second	1.84	1.83	1.83	1.76	1.76	1.49
Direct	1.00	1.00	1.00	1.00	1.00	1.00
Reverse	4.14	3.80	3.80	3.95	3.95	3.34

LUBRICANT	
Capacity	Refer to Group O "Lubrication"
Type	Auto. Transmission Fluid Type "A" Suffix "A"
Gears	Helical
TOLERANCES	
Second Speed Gear End Play	.002 to .014"
Countershaft End Play	.0045 to .028"
Clutch Housing Face Run-Out	.006" Max.
Clutch Housing Bore Run-Out	.008" Max.

SPECIAL TOOLS

DD-1014	Repair Stand	C-464	Arbor (idler gearshaft)
C-3281	Holding Tool	C-3789	Installer (seal)
C-452	Puller	C-3751	Installer (bushing)
C-3755	Driver	C-3754	Installer (oil seal)
C-578	Arbor (countershaft)	C-3767	Protector (shift shaft oil seal)
C-3766	Installer (seal)	C-3753	Puller (extension seal)
C-3765	Installer (detent ball)	C-3806	Fixture (engine support)

TORQUE REFERENCE

	Foot-Pounds	Inch-Pounds
Front Bearing Retainer Bolts	—	360
Extension Housing Bolts	50	—
Nuts	50	—
Gearshift Operating Lever Nuts	—	180
Mainshaft Flange Nut	175	—
Transmission to Clutch Housing Bolts	50	—

1A-3-SPEED MANUAL TRANSMISSION

The three speed Manual Transmission used on 6-cylinder vehicles is referred to as Model A-903 and the three speed Heavy Duty Manual Transmission used on 8-cylinder vehicles is referred to as Model A-745. The Model A-745 with modifications is also used on 6-cylinder Plymouth Models for Taxi and Police car operations. The service procedures are the same except where noted.

The three speed manual transmission (Fig. 1) is of the synchromesh type with helical cut gears to provide silent operation. The countershaft gear is in constant mesh and is supported by two rows of the roller bearings at each end. The mainshaft is supported by ball bearings at each end of the extension housing. The speedometer drive gear is integral with the mainshaft.

SERVICE PROCEDURES

1. TRANSMISSION

Removal (From the Vehicle)

(1) Drain the lubricant from the transmission.

(2) Disconnect the propeller shaft, speedometer cable, housing and the gearshift control rods. Disconnect parking brake control cable, and interlock rod (if so equipped).

CAUTION: Remove the speedometer cable (pinion comes out with the cable) with the hand so that the housing is not crushed.

(3) Remove the back-up light switch leads (if so equipped).

(4) Install engine support fixture C-3806, mounting hooks firmly into the holes in the side of the frame members with the support ends up against the underside of the oil pan flange.

(5) Adjust the fixture to support the weight of the engine, then raise engine slightly and remove the rear support attaching bolts. Remove the crossmember.

(6) Support the transmission, using a suitable jack, then remove the bolts that attach the transmission to the clutch housing.

(7) Slide the transmission rearward until the pinion shaft clears the clutch disc before lowering the transmission. (This precaution will avoid damaging the clutch disc).

(8) Lower the transmission and remove from under the vehicle.

(9) Mount the transmission in repair stand, DD-1014.

Disassembly (Figs. 1 and 2)

(1) Using flange holding Tool C-3281, remove the flange retaining nut and washer.

(2) If necessary, attach puller Tool C-452, and remove the flange assembly.

(3) Remove the bolts that attach the cover to the case. Remove the cover and discard the gasket.

(4) Using a pair of feeler gauges, measure the synchronizer float. The measurement of the "float" should be taken before any further disassembly of the transmission is attempted.

(5) The synchronizer "float" should be between .050 and .090 inch, when measured between the synchronizer outer ring pin and the opposite synchronizer outer ring. This measurement must be made on two pins, 180° degrees apart with equal gap on both ends for "float" determination, as shown in Figure 3.

(6) There should be a snug fit between the pins and the outer rings, similar to that obtained when measuring with a micrometer.

Extension Housing

(1) Remove the bolts and one nut that attaches the extension housing to the transmission case. Slide the extension off the mainshaft. Discard the gasket.

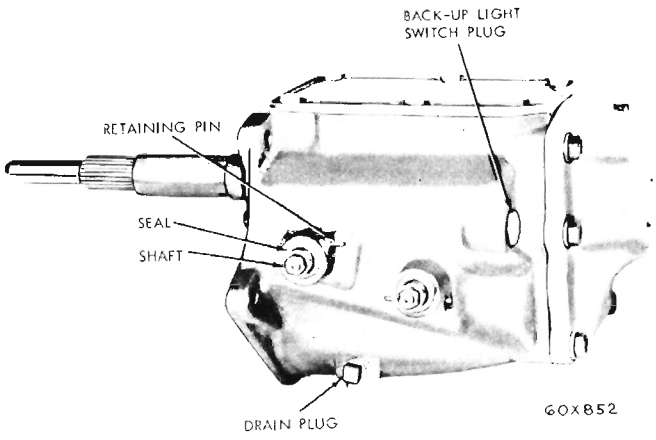
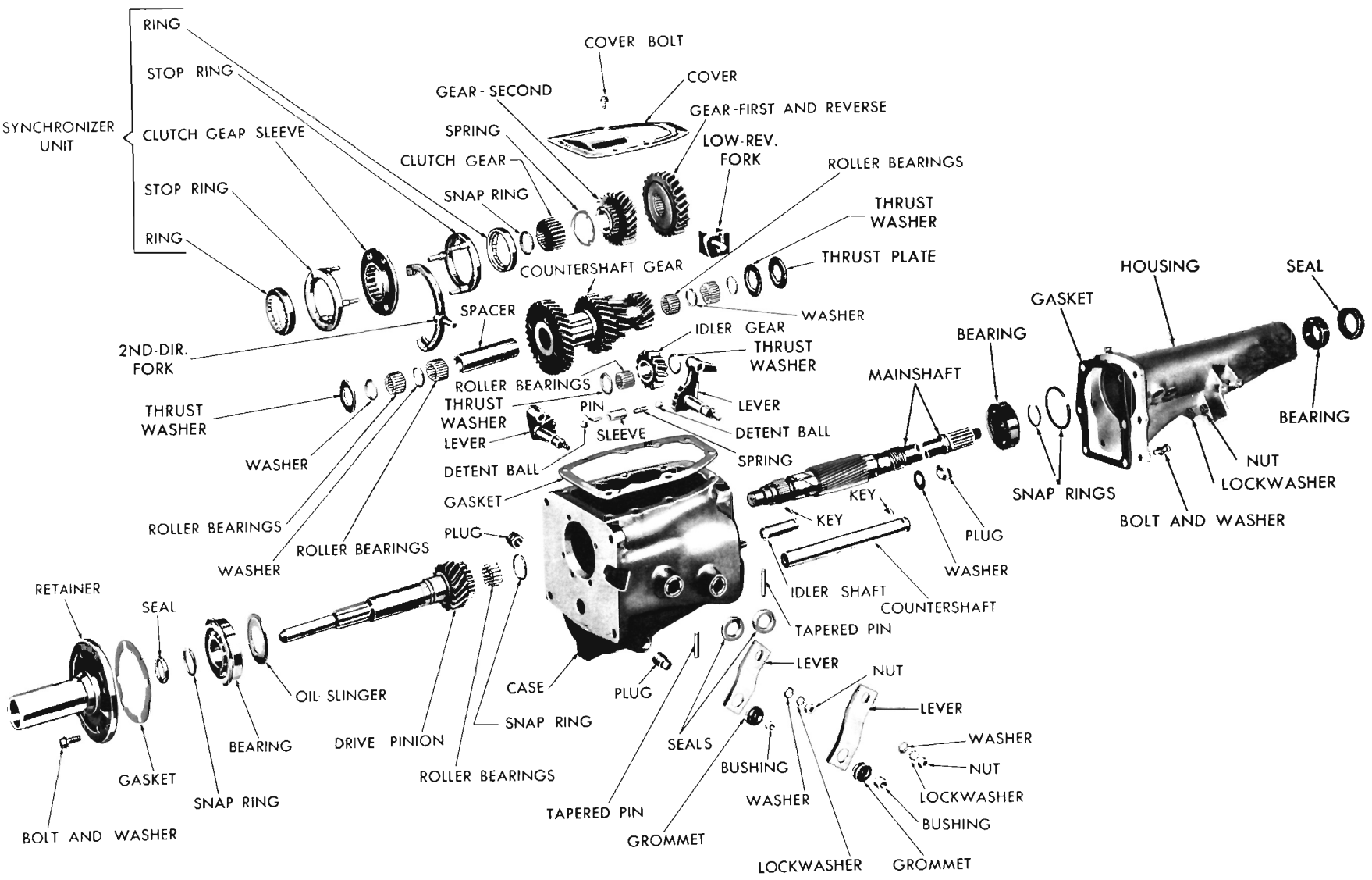


Fig. 1—Transmission Assembly (6-Cylinder)



61 x 325C

Fig. 2—3-Speed Manual Transmission (Disassembled)

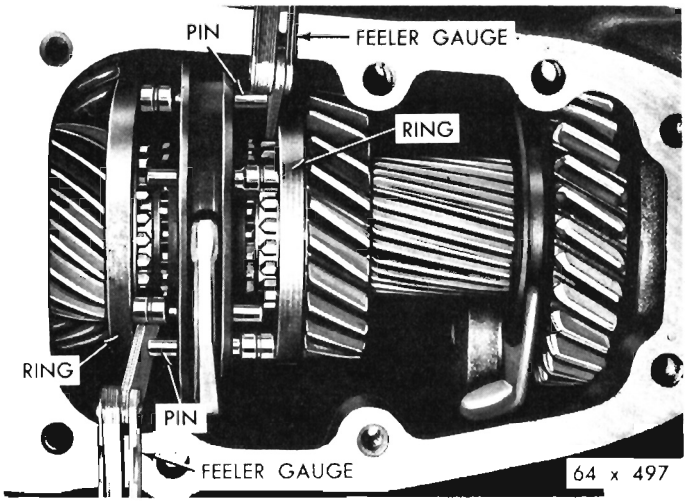


Fig. 3—Measuring the Synchronizer "Float"

Remove the oil seal, using Tool C-748, (6 cyl.) C-3753 (8 cyl.).

(2) Remove the extension housing and mainshaft bearing, (8 cyl.), (6 cyl.) bushing (Tool C-3755).

Drive Pinion

(1) Remove the bolts that attach the main drive pinion bearing retainer, then slide the retainer off the pinion. Discard the gasket and drive the seal out of the retainer, using a suitable drift.

(2) On the 8 cylinder, when removing the drive pinion and bearing assembly from the transmission case, slide the synchronizer front inner stop ring from the short splines on the pinion as the assembly is being removed from the case, as shown in Figure 4.

On the 6 cylinder, grasp the pinion shaft with the hand and pull the assembly out of the case. (It may be necessary to tap the shaft lightly to aid in its removal.) **Be careful not to bind the inner synchronizer ring on the drive pinion clutch teeth.**

(3) Remove the snap ring which locks the main drive pinion bearing on the pinion shaft, using snap pliers. Remove the pinion bearing washer, then carefully press the pinion shaft out of the bearing, using an arbor press. Remove the oil slinger. (Refer to Fig. 5.)

(4) Remove the 14 bearing rollers from the cavity in the end of the drive pinion (15 bearing rollers 8-Cyl) using a hook or a flat blade.

Mainshaft

(1) With the transmission in reverse, remove the outer center bearing snap ring, using a hook or a flat blade, then partially remove the mainshaft.

(2) Cock the mainshaft, then remove the clutch sleeve, the outer synchronizer rings, the front inner ring and the 2-3 shift fork. (Refer to Figs. 6 and 7.)

(3) Remove the clutch gear retaining snap ring, using snap ring pliers. Slide the clutch gear off the end of the mainshaft.

(4) Slide the second speed gear, stop ring and the synchronizer spring off the mainshaft.

(5) Remove the low and reverse sliding gear and shift fork as the mainshaft is completely withdrawn from the case.

(6) Remove the countershaft gear, and the thrust washers from the case.

(7) Remove the bearing rollers (88) spacer rings (4) and the center spacer from the countershaft gear.

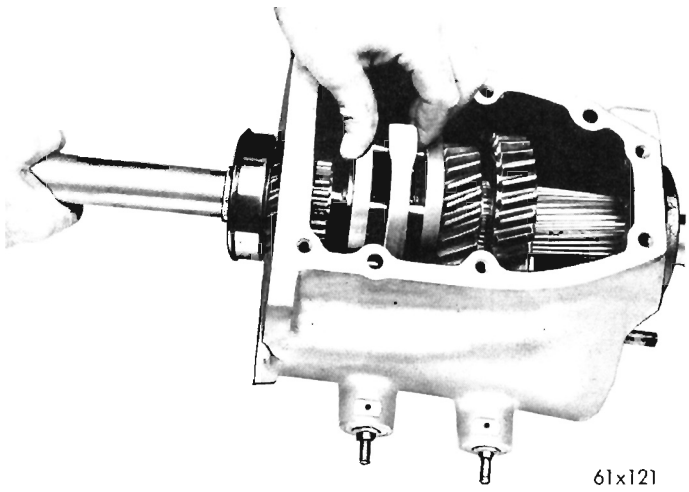


Fig. 4—Removing Drive Pinion Assembly

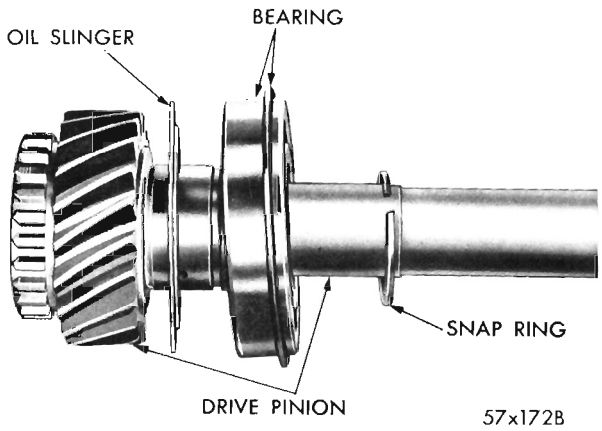
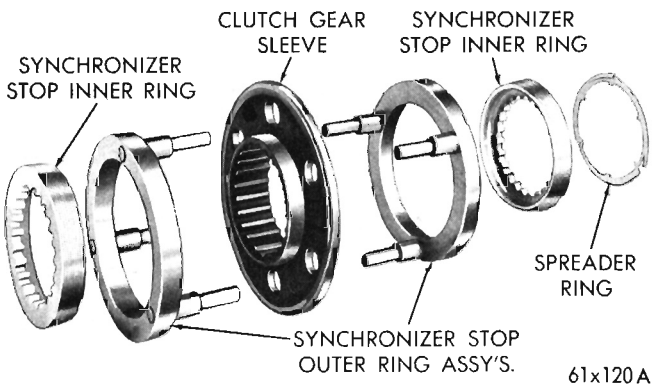


Fig. 5—Drive Pinion Assembly



Synchronizer Unit (8-Cylinder)

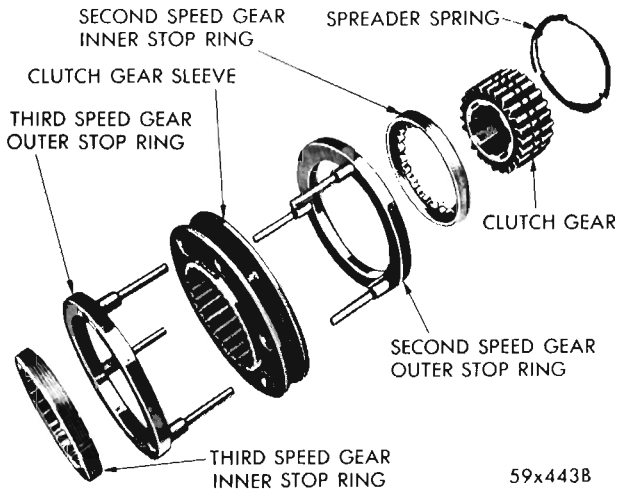


Fig. 6—Synchronizer Unit (6-Cylinder)

Countershaft Gear (6 Cylinder)

(1) Using a feeler gauge measure the end play of the cluster gear. The end play should be from .0045 to .028 inch. This measurement will determine if new thrust washers are to be installed at reassembly.

(2) Using Tool C-578, drive the countershaft rearward and out of the case. Remove the woodruff key from the end of the shaft.

Countershaft Gear (8 Cylinder)

CAUTION: Do not drive the countershaft toward the front of the transmission case.

(1) Using countershaft bearing arbor Tool C-3834, drive the countershaft toward the rear of the case until the small key can be removed from the countershaft.

(2) Drive the countershaft the remaining way out of the case, keeping the arbor tight against the end of the countershaft to prevent loss of the bearing rollers.

(3) Remove the cluster gear, thrust washers and the thrust plate from the case.

(4) Remove the bearing rollers, (4) washers and the center spacer from the cluster gear.

Reverse Idler Gear

(1) Using a suitable drift, drive the reverse idler gear shaft towards the rear and out of the case. Remove the woodruff key from the end of the shaft.

(2) Lift out the reverse idler gear, thrust washers and bearing rollers (22) out of the case. Remove the bearing rollers from the gear.

Gearshift Mechanism (6 Cylinder)

(This operation need only be done if the seals are leaking).

(1) Remove the operating levers from their respective shafts.

(2) Drive out the tapered retaining pin (shown in Figure 1) from either of the two lever shafts, then withdraw levershaft from inside the transmission. (The detent balls are spring loaded; as the shaft is being withdrawn, the ball will drop to the bottom of the case.)

(3) Remove the interlock sleeve, spring, pin and both balls from the case. (Refer to Fig. 7.) Drive out the remaining tapered pin, then slide the lever shaft out of the transmission.

(4) Using a suitable drift, drive out the lever shaft oil seals and discard.

Gearshift Mechanism (8 Cylinder)

(This operation need only be done if seals are leaking.)

(1) If necessary, remove both the lever shaft seals, using Tool C-3638.

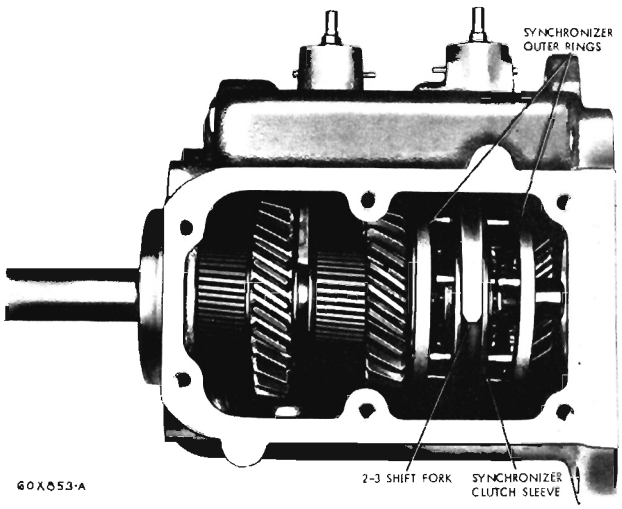


Fig. 7—Synchronizer Assembly (6-Cylinder)

(2) Using a small punch, remove the low and reverse gear lever shaft tapered lock pin by driving it toward the top of the transmission case.

(3) Remove the second and third gear lever shaft in the same manner.

(4) Remove the lever shafts from the transmission case, taking care not to lose the spring loaded detent balls.

(5) Remove the interlock sleeve, spring, pin and the detent balls.

Cleaning and Inspection

Clean all the parts (including the case) in a suitable solvent and blow dry with compressed air.

CAUTION: Do not spin the bearings with compressed air. The bearings should be immersed in clean solvent and rotated by hand until clean. A bearing that is spun by air pressure is likely to score due to the absence of lubrication.

Lubricate the cleaned bearings with light oil, then turn by hand to test for roughness, looseness or wear. Test the fit of the bearings on their respective shafts and in the bores. Inspect the second speed gear and the reverse idler gear needle bearings for scoring or wear. Inspect the mainshaft splines for galling or scoring. Inspect bearing mounting surfaces and snap ring grooves. Slight nicks or burrs can be stoned off. Inspect the gear teeth on the synchronizer clutch gear and sleeve. If there is evidence of chipping or excessively worn teeth, install a new part at reassembly. Be sure the clutch sleeve slides freely on the clutch gear.

Install a new gear, if any of the gear teeth are broken, chipped or excessively worn. Small nicks or burrs can be stoned smooth.

Inspect the clutch teeth in the drive pinion. If excessively worn, broken or chipped, install a new pinion. Inspect the mainshaft pilot bearings (drive pinion) for pitting or scoring. If either of these conditions exist, install a complete new set of bearings.

Inspect the bearing rollers removed fom the gear for pitting or scoring. If necessary, install a new set as required.

Inspect the general condition of the transmission case and extension housing and all the threaded holes and plugs for stripped or pulled threads.

Inspect all mating and gasket surfaces for roughness and scratches. Inspect the castings for small cracks and sand holes.

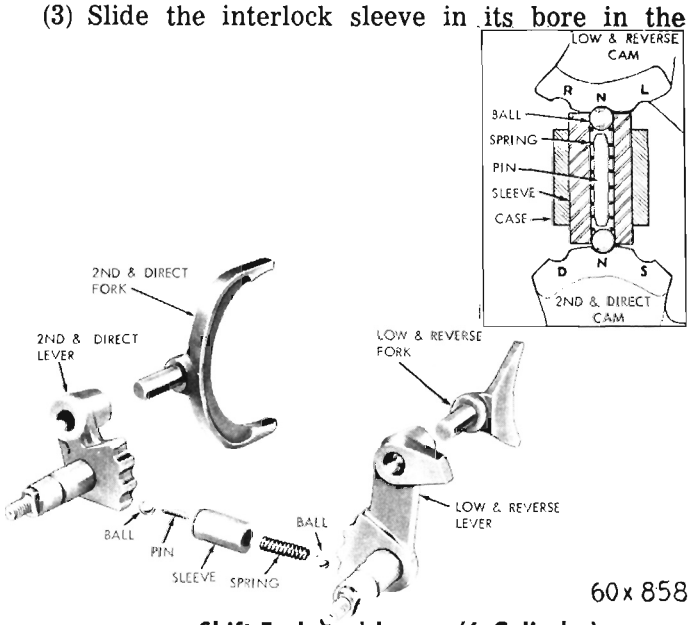
Inspect the interlock sleeve and pin for free movement in their bores. Examine the detent balls and pins for brinneling. If the lever detents show signs of excessive wear to the extent of not locking in the gear, install a new lever and shaft. Inspect the shift forks for wear on the shanks and pads.

Assembly

(1) Place two new shift lever shaft seals centered over their bores in the case. Using Tool C-3766, (C-3650 8 cyl.) drive both seals into the case, until the tool bottoms.

(2) Install Tool C-3767, then slide the low and reverse lever shaft into the rear boss of the case. through the seal and into position. Lock in position with the tapered pin. Turn the lever until the center (neutral) detent is in line with the interlock bores. (Use sealer on the pins.)

(3) Slide the interlock sleeve in its bore in the



Shift Fork and Levers (6-Cylinder)

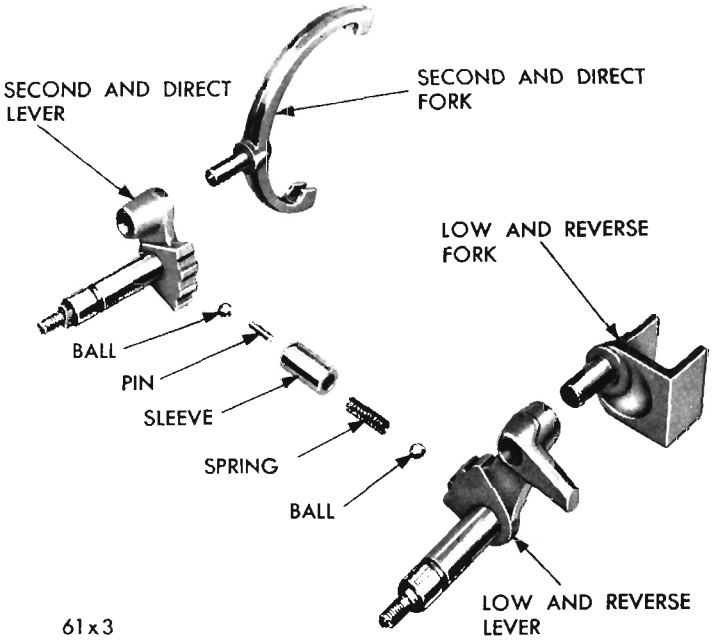


Fig. 8—Gearshift Forks and Shafts (8-Cylinder)

case followed by one of the interlock balls. Install the interlock spring and pin (Refer to Fig. 8).

(4) Place the remaining interlock ball on top of the interlock spring, using Tool C-3765. (A good method of installing the second ball is to stick the ball in the tool recess by means of lubricant, then use the tool to position the ball on the detent spring.)

(5) Install seal protector Tool C-3767, on the second and high lever shaft, depress the interlock ball, using Tool C-3765 and at the same time install the second and high lever into the fully seated position, with the center detent (neutral) aligned with the detent ball. Remove the tool. Secure the lever shaft with the remaining tapered pin.

Reverse Idler Gear

(1) Coat the bore of the gear with lubricant, then slide arbor Tool C-464 into the bore. Lubricate the 22 bearing rollers, then install in the area around the arbor.

(2) Install a new thrustwasher at each end of the gear and over the arbor. (Use enough lubricant to hold the washers in position.)

(3) With the bevelled ends of the teeth forward, slide the gear down into position in the case. Install the gear shift in its opening at the rear of the case. Install woodruff key then position the shaft with the keyway.

(4) Raise the idler gear slightly to align with the shaft, then drive the shaft into the case through the thrust washer and gear, until the end of the shaft is approximately $\frac{1}{64}$ inch below the surface of the case. Remove Tool C-464 from the case.

Countershaft Gear

(1) Slide the countershaft gear needle bearing spacer over Tool C-578, then coat the bore of gear with lubricant. Slide the tool and spacer in the gear bore.

(2) **Six Cylinder Cars:** Lubricate the bearing rollers and install 22 rollers in each end of the gear in the area around the arbor.

Eight Cylinder Cars: Lubricate the bearing rollers and install 22 rollers, the spacer washer, and another 22 rollers in each end of the gear around the arbor.

Install the bearing washers at each end of the gear covering the bearings. (Add a small amount of grease to hold the washers in place).

(3) Install the thrustwashers at each end of the countershaft gear and over the arbor. (Use lubricant to hold the washers.) Install the countershaft gear in the case, making sure the tabs on the thrustwashers slide into the grooves in the case.

Mainshaft

(1) Install the low and reverse fork, (with the offset to the rear) and engage the fork in the low and reverse sliding gear, then positiion in the case by shifting into reverse.

(2) Slide the mainshaft into the case and through the low and reverse gear.

(3) Install the second and third shift fork with the offset toward the rear of the case.

In cases where the synchronizer "float" measurement was above .090 inch, synchronizer shims Part Number 2464724 should be installed to reduce the "float" to .090 inch or less. Install the shim on the shoulder of the second speed gear, before the spreader spring is installed, as shown in Figure 9.

If the synchronizer "float" is below .050 inch, material should be removed from the ends of all six synchronizer pins (an equal amount) until the synchronizer "float" is above the .050 inch dimension.

(4) Install the second speed gear and spreader spring and/or shims, if required on the mainshaft.

Install the second gear inner stop bronze ring and the second gear outer stop ring assembly (Refer to Fig. 6). Engage the synchronizer clutch sleeve with the second and high shift fork.

(5) Slide the clutch gear over the end of the mainshaft and down against the second speed gear. Select a snap ring of the correct thickness and install. (This snap ring eliminates end play and must be a snug fit.) Install the synchronizer clutch gear snap ring in the mainshaft groove. Make certain the ring is bottomed all the way around in the groove.

Measure the clearance between the clutch gear and second speed gear. The clearance should be from .004 to .014 inch. (The end play in excess of .014 inch will permit gear to "jump out".)

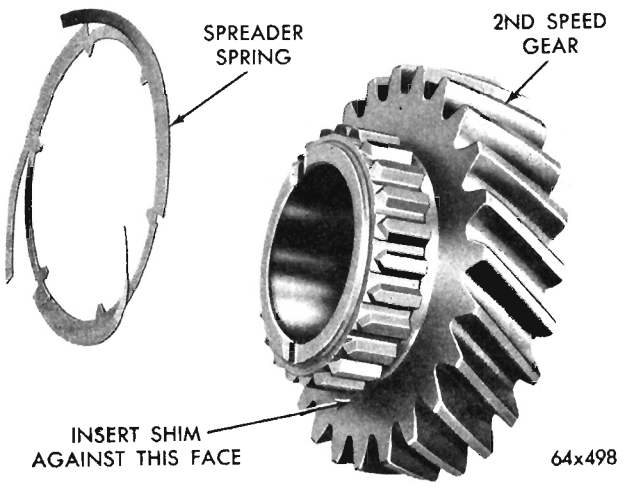


Fig. 9—Synchronizer "Float" Shim Location

(6) Position the mainshaft further in the case by tapping on the outer bearing race; bottoming the bearing (alternate from one side to the other). Install the bearing snap ring in the case. **This snap ring is a select fit.**

Drive Pinion

(1) Slide the oil slinger (if removed) over the pinion shaft and down against the rear. (Refer to Fig. 5).

(2) Slide the bearing over the pinion shaft (snap ring groove away from the gear end), then seat on the shaft, using an arbor press.

NOTE: Be sure the slinger does not "hang up" in the snap ring groove during the pressing operation.

(3) Secure the bearing and washer with the selected thickness snap ring. Four snap rings are available to eliminate end play (same thickness as clutch gear and mainshaft snap rings).

Be sure the snap ring is properly seated. If the large snap ring around the bearing was removed, install at this time.

(4) Place the pinion shaft in a vise (with soft jaws). then install the 14 rollers for 6-cylinder, or 15 for 8-cylinder, using lubricant to hold them in place. Install the bearing retaining ring in its groove.

(5) Refer to Figure 6, then install the third gear outer stop ring and the third gear inner stop ring. Guide the drive pinion through the front of the case and engage the inner stop ring with the clutch teeth, then seat the bearing.

The pinion shaft bearing is fully seated when the snap ring is in full contact with the case.

(6) Install a new seal in the pinion bearing retainer, using Tool C-3789.

(7) Slide the pinion bearing retainer (less gasket) over the shaft and down against the case.

(8) Hold the retainer against the case, using hand pressure, then measure the clearance between the retainer and case, using a feeler gauge.

Select a gasket from .003 to .004 inch thicker than the clearance. (This is done to eliminate bearing end play.)

(9) Install gasket of correct thickness, then reinstall pinion retainer. Install attaching bolts and tighten to 360 inch pounds torque.

(10) Use the countershaft and drive the arbor Tool C-578 forward and out of the countershaft gear until the woodruff key can be inserted in the countershaft. Continue to drive shaft into case, until approximately $\frac{1}{64}$ inch below the surface of the case.

Extension Housing

(1) Install a new rear mainshaft bushing, using Tool C-3751. (As the tool is being removed, it burnishes the bushing.) (8 cyl. uses a bearing.)

(2) Install the extension housing oil seal using Tool C-3754.

Place seal protector Tool C-3768 in position on the mainshaft splines to protect the oil seal while installing extension housing.

CAUTION: Damage to the oil seal will result if the tool is not used.

(3) Lightly lubricate the gasket surface of the case and the seal protector tool. Install the extension housing gasket.

(4) Slide the extension housing over the mainshaft and down against the case, at the same time guiding the shaft into the oil seal. Install attaching bolts and tighten to 50 foot-pounds torque.

(5) Install the flange assembly, and secure with a new washer and nut. Tighten the nut to 175 foot pounds torque while holding the flange with Tool C-3281.

(6) Lightly lubricate the cover gasket surface, then install gasket and cover. Install the attaching bolts and tighten to 144 inch-pounds torque.

(7) Install the drain plug and back-up light switch (if so equipped) and tighten securely.

(8) Refill the transmission with Automatic Transmission Fluid, Type "A", Suffix "A". Install filler plug and tighten securely.

Installation (In the Vehicle)

(1) Remove the transmission from the repair stand. Install rear crossmember and support, then slide under vehicle.

(2) Raise the transmission, using a suitable jack, until the main drive pinion is centered in the clutch housing bore.

(3) Roll the transmission slowly forward until the pinion shaft enters the clutch disc. Turn the pinion shaft until the splines are aligned, then push transmission forward until seated against clutch housing.

NOTE: Do not allow the transmission to "hang" after the pinion has entered the clutch disc.

(4) Install the transmission attaching bolts and tighten to 50 foot-pounds. Remove the jack.

(5) Using a pointed drift, align the crossmember bolt holes, then install attaching bolts. Tighten to 50 foot-pounds torque.

(6) Remove the engine support fixture and disengage the hooks from the holes in the frame side rails.

(7) Install the speedometer drive pinion and cable assembly.

(8) Reconnect the gearshift rods, propeller shaft, and back-up light switch leads (if so equipped).

(9) Road test the vehicle, making sure the transmission shifts smoothly and operates quietly.

(10) If the shift linkage requires adjustment, refer to Paragraph 2.

2. GEARSHIFT LINKAGE

Adjustments

(1) With the 2nd and 3rd control rod disconnected from the lever on the column and the 1st and reverse control rod disconnected from the transmission lever, position both transmission levers in neutral. (The neutral detent balls must be engaged to make this adjustment correctly.) To test, start the engine (with clutch disengaged) then release the clutch slowly.

(2) Inspect the axial freedom of the shift levers in the column assembly. If the outer end of the levers move axially over 1/16 inch, loosen the two upper bushing screws and rotate the plastic bushing (downward), until all free play of the levers has been removed. Retighten the bushing screws securely. (Refer to Fig. 9.)

(3) Install a wedge or suitable tool between the cross-over blade and the 2nd and 3rd lever, so that the cross-over blade is engaged with both lever cross-over pins, as shown in Figure 10.

(4) Adjust the swivel on the end of the 2nd and 3rd control rod until the stub shaft of the swivel enters the hole in the column lever. Install the washers and clip to secure. Tighten the swivel lock nut to 70 inch-pounds torque. (Refer to Fig. 10.) During the above setting, the 2nd and 3rd control rod should be adjusted to also position the selector lever (on the column) 5 degrees above horizontal level on the Plymouth Models and 10 degrees on the Valiant Models (transmission in neutral).

(5) Slide the clamp and swivel (on the end of the 1st and reverse control rod) either **in** or **out,** until the swivel stub shaft enters the hole in the transmission lever. Install washers and clip to secure. Determine the mid back-lash position in the linkage, then tighten the clamp bolt to 100 inch-pounds torque.

(6) Remove the positioning wedge or tool from the cross-over blade and lever, then move the selector lever through all positions to test the adjustments to insure cross-over smoothness.

3. REAR OIL SEAL

Removal

(1) Disconnect propeller shaft at the transmission flange and secure shaft to frame member for clearance.

(2) Hold the mainshaft flange with Tool C-3281 and remove flange nut and washer.

(3) Remove the transmission flange, use Tool C-452 if necessary.

(4) Remove the oil seal with Tool C-748.

Installation

(5) Drive the new seal into the extension housing with Tool C-3837.

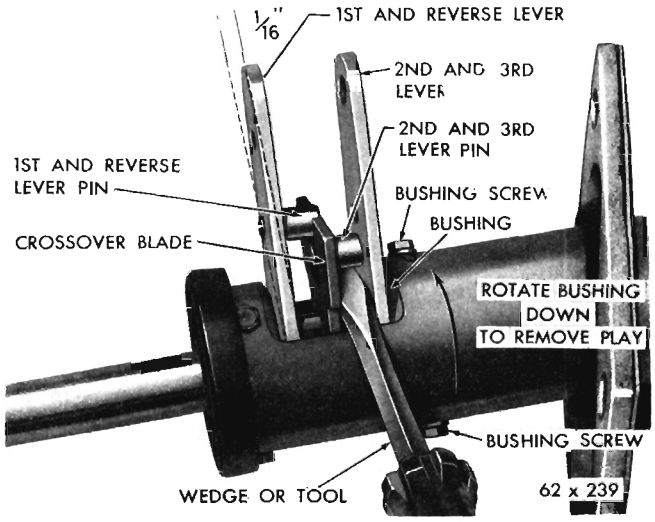


Fig. 10—Gearshift Lever Adjustment

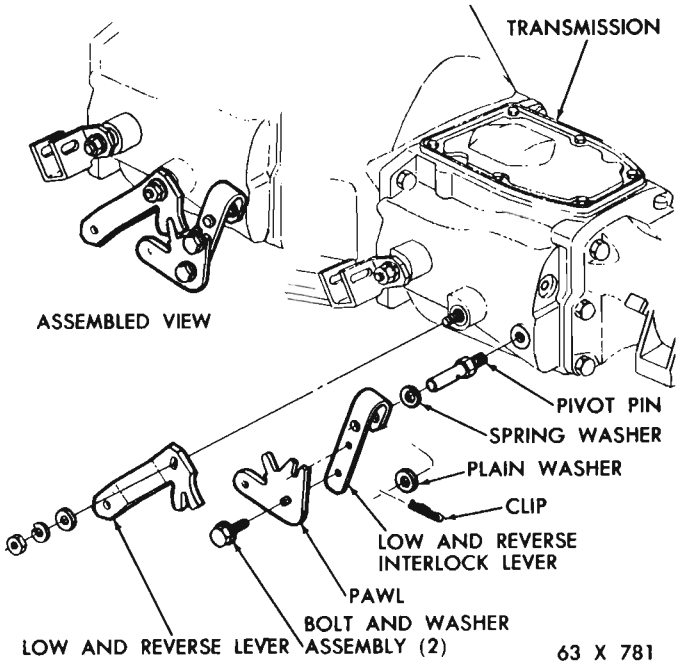


Fig. 11—Gearshift Interlock

(6) Install the transmission flange, washer and nut. Tighten the nut to 175 foot-pounds.

(7) Reconnect the propeller shaft and tighten flange nuts to 30 foot-pounds.

4. GEARSHIFT INTERLOCK ADJUSTMENT (If so Equipped) (Taxi Only)

Pawl Adjustment (Refer to Fig. 11)

(1) After installation of the transmission levers, shift the transmission into neutral.

(2) Install the pawl lever with the anti-rattle washers and retaining clip.

(3) Assemble the pawl to the pawl lever, leaving the attaching bolts loose.

(4) Rotate the pawl forward into **full** engagement with the 1st-rev. lever pawl slot.

(5) Position the pawl to provide equal clearance with the pawl slot on both sides of the pawl.

(6) Tighten the two pawl bolts to 200 inch-pounds torque.

Linkage Adjustment

(1) With the clutch linkage installed and adjusted, make sure the clutch pedal is in the fully returned position. Shift the transmission into neutral.

(2) Install the interlock rod with anti-rattle washers and clips leaving the sliding adjustment bolt loose.

(3) Rotate the pawl lever forward to bottom the pawl in the transmission 1st-rev. lever pawl slot. Then tighten the sliding clamp bolt to 100 inch-pounds torque.

CAUTION: Do not pull the interlock rod backwards against the fork pull back spring load during this adjustment.

To determine if the linkage has been properly adjusted, perform the following two tests with the engine **not** running.

(1) Shift the transmission in the normal manner with the clutch disengaged from neutral to first, and from neutral to reverse engaging the clutch when in gear. If operation is not normal, readjust the pawl and linkage as described above.

(2) Disengage the clutch. Shift the transmission half-way between neutral and first. Let out the clutch pedal. The interlock, when properly adjusted should allow the pedal to return to about 5″ from the fully returned position.

SPEEDOMETER PINION USAGE CHART

(Manual Transmission)

Model	Tire Size	Axle Ratio	Manual Trans.	Output Shaft Teeth	Teeth	Pinion Color
Valiant	650-13	3.23:1	Std.	7	19	Dark Blue
VV-1		3.55:1	Std.	7	20	Green
		3.91:1	Std.	7	20*	Green
Plymouth	650-14	3.31:1	Std.	7	18	Dark Purple
VP-1		3.58:1	Std.	7	20	Green
		3.23:1	H.D.**	7	18	Natural
		3.58:1	H.D.**	7	20	Black
Plymouth	700-14	3.31:1	Std.	7	18	Dark Purple
V P-2		3.58:1	Std.	7	19	Dark Blue
		3.23:1	H.D. **	7	18	Natural
		3.58:1	H.D. **	7	20	Black

*Use .909:1 Ratio Adapter

**Heavy Duty

1B - 4 FORWARD SPEED MANUAL TRANSMISSION

SPECIFICATIONS

Engine Displacement (Cu. In.)	170-225	361, 383, 413
TRANSMISSION MAKE	Chrysler	
Gear Ratio		
First	3.09	2.66
Second	1.92	1.91
Third	1.40	1.39
Fourth	1.00	1.00
Reverse	3.00	2.58
Rear Axle Ratios		
Standard	3.23	3.23
*Optional	3.23	3.23
Sure-Grip	3.23	3.23
Lubricant		
Capacity	7½ Pints	7½ Pints
Type	Automatic Transmission Fluid, Type "A", Suffix "A"	
Gear Type		
All Gears (except Reverse)	Helical	
Tolerances		
Clutch Housing Face Runout	.006"	
Clutch Housing Bore Runout	.008"	
Countershaft Gear (cluster) End Play	.0045 to .028"	

*Gear Sets available through MoPar 2.93, 3.55, 3.91, 4.1, 4.3, 4.56, 4.89.

SPECIAL TOOLS

C-452 . . . . . Flange Holder
C-748 . . . . . Oil Seal Remover
C-3787 . . . . . Fixture, Leg
C-3806 . . . . . Fixture, Engine Support
C-3789 . . . . . Seal Installer
C-3837 . . . . . Oil Seal Installer
C-3938 . . . . . Countershaft Arbor
C-3591 . . . . . Lever Aligning Tool

TORQUE RERFERENCE

	Foot-Pounds	Inch-Pounds
Extension Housing to Case Bolts	35-45	—
Main Drive Pinion Bearing Retainer Bolts	15-20	—
Transmission to Clutch Housing Bolts	50	—
Crossmember Attaching Bolts	50	—
Shift Mechanism Pivot Bolt	55	—
Shift Lever Bolts	30	—
Companion Flange Nut	175	—
Gearshift Housing Bolts	—	144
Gearshift Operating Lever Nuts	—	216
Transmission Drain Plug	—	300

4 FORWARD SPEED MANUAL TRANSMISSION

The A-833 four forward speed synchromesh transmission shown in Figure 1, consists of a series of helical gears designed for high torque capacity and with teeth so proportioned as to operate at high speeds without excessive friction loss or heat generation. The shafts, bearings, synchronizers and other precision parts are held to close tolerances to provide durability during extended heavy operation.

The main drive pinion is supported by a heavy duty ball bearing at the rear, and an Oilite bushing pressed into the end of the crankshaft. The main shaft front end is piloted in 16 needle type roller bearings, located in a cavity in the end of the main drive pinion (Fig. 2) and is supported by a heavy duty ball bearing in the center of the case. The rear end of the mainshaft is supported by a ball bearing pressed on the end of the mainshaft and a snug fit in the end of the extension housing, as shown in Figure 2.

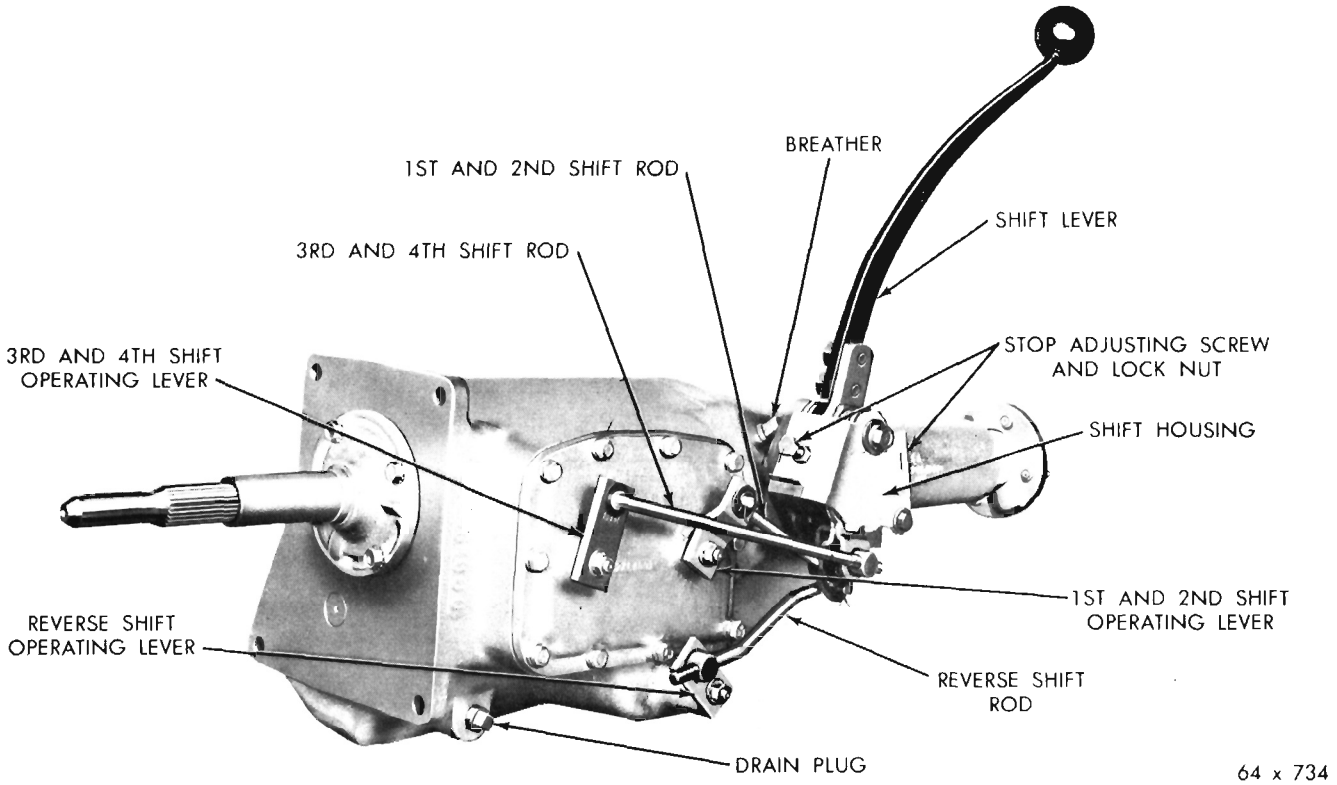


Fig. 1—Four Forward Speed Transmission Assembly

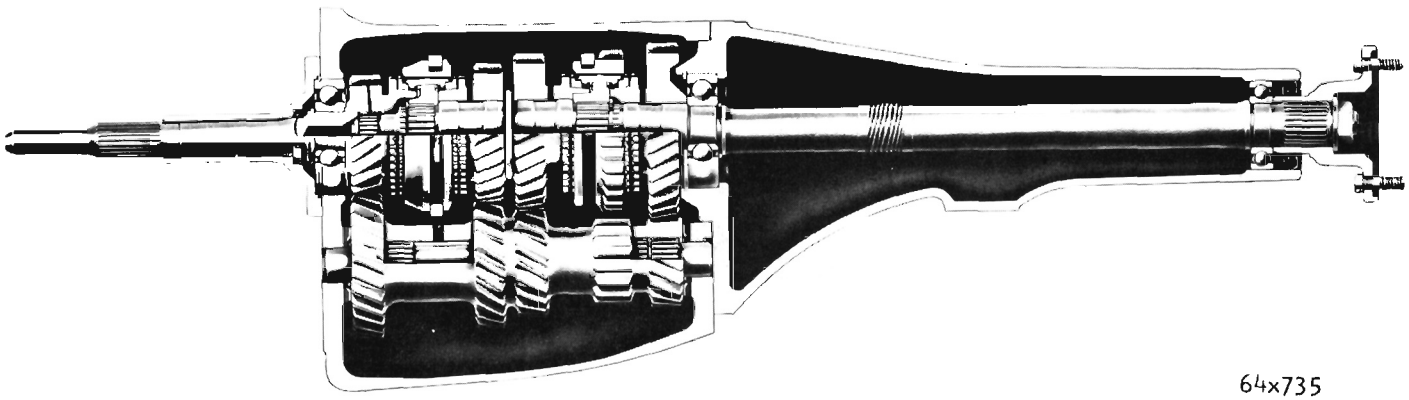


Fig. 2—Four Forward Speed Transmission (Sectional View)

The countershaft gear (cluster) is supported by a double row of needle type roller bearings (38) at each end and the thrust is taken on thrustwashers between the ends of the gear and the transmission case. The alignment of the needle type roller bearings within the gear are maintained by 4 thrust washers (one being used between the rows of roller bearings and one at each end. (Fig. 2).

The reverse idler gear is supported on a bronze bushing, pressed into the gear.

The gearshifting is manually operated through shift control rods to the transmission (Fig. 1). Any forward gear may be engaged while the vehicle is in motion through the use of synchronizing clutches (Fig. 2).

The transmission may be used as an aid to deceleration by downshifting in sequence without double clutching or gear clashing, due to the fact that all forward speeds are synchronized. **(The reverse speed gear is not synchronized).** The service procedures covering the Valiant four forward speed transmission is identical to the following service procedures except where noted.

SERVICE PROCEDURES

1. ADJUSTING THE SHIFT LINKAGE

(1) Remove the shift boot attaching screws and slide the boot up on the shift lever (Fig. 3). Test to be sure the pivot bolt is tightened securely (55 foot-pounds). Test to be sure shift lever bolts are tightened securely (30 foot-pounds).

(2) Disconnect all the shift rods from the levers at the adjusting swivels by removing the spring clip retainers and flatwashers.

(3) Slide Tool C-3591 over the levers, inserting center pin through the first two levers. Tighten set screw securely. (This aligns the 3 levers in the gear shift control assembly, and holds them in the neutral position, as shown in Figure 3.)

(4) Adjust the length of the three shift rods, by turning the swivels either **in** or **out** until the swivel stub shafts match the control rod lever holes (Transmission shift operating levers must be in the neutral detent position during this Adjustment.) Install the swivel stub shafts and secure the flat washers and spring clip retainers.

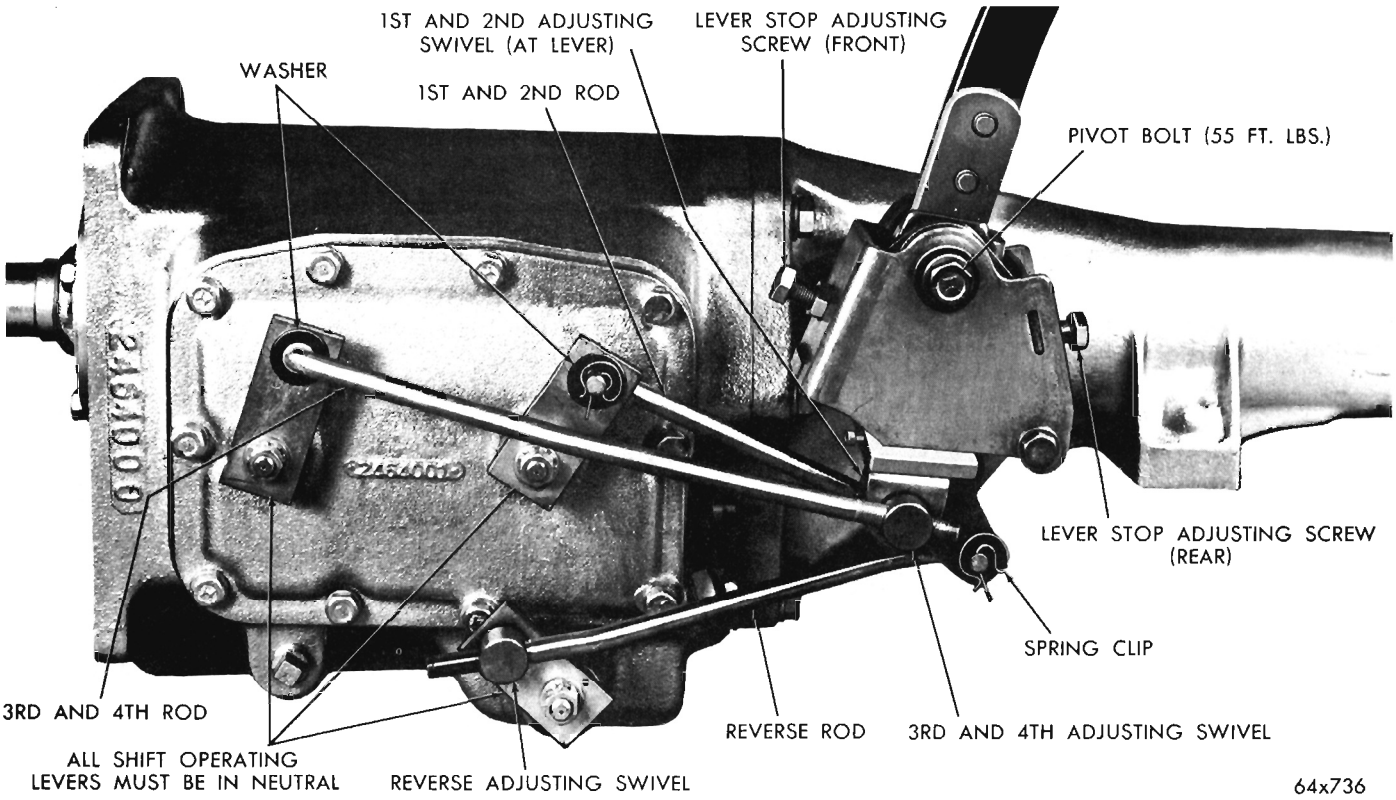


Fig. 3—Gearshift Linkage Adjustments

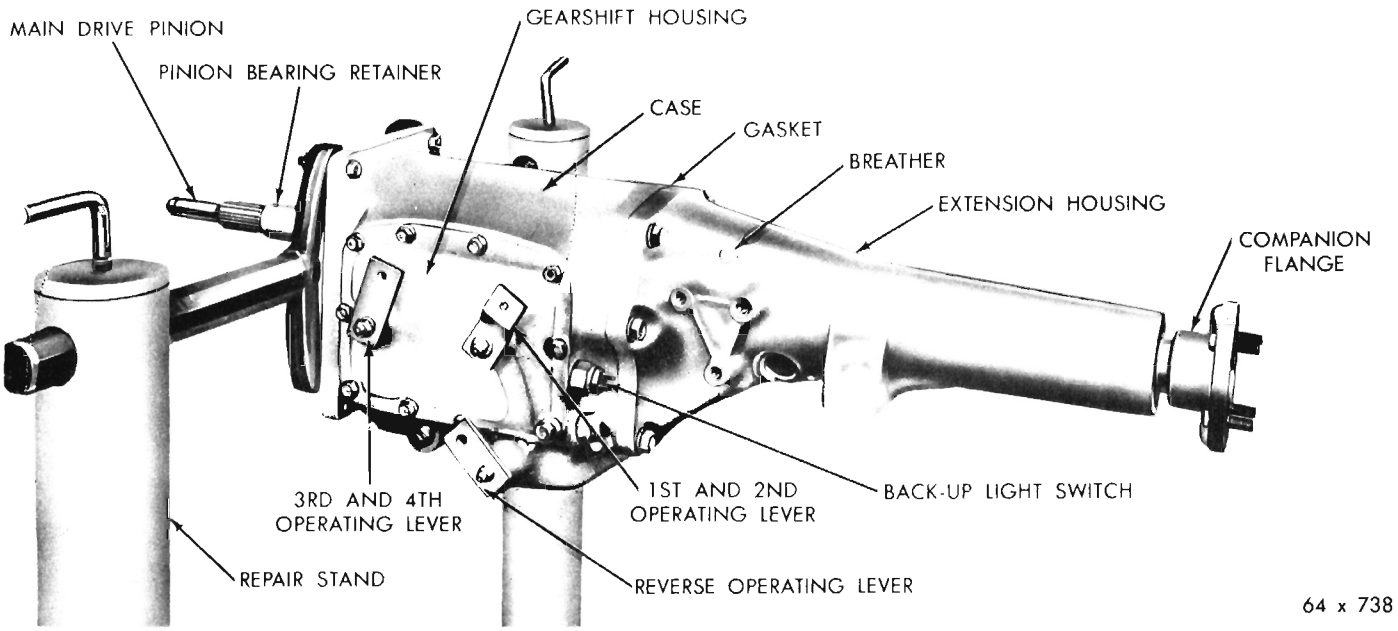


Fig. 4—Four Forward Speed Transmission in Repair Stand

(5) Remove the lever aligning tool.

(6) With the transmission hand shift lever in the third or fourth speed detent position, adjust the lever stop screw (front and rear) to provide from .020 to .040 inch clearance between the lever and the stops. When this adjustment has been made, tighten the adjusting screw locknuts securely.

(7) Inspect the linkage for ease of shifting into all gears and for smoothness of crossover and handshift lever clearances.

CAUTION: Because there is no reverse gear interlock, it is very important that the transmission linkage adjustments are correctly performed in order to prevent the possibility of engagement into two gears at the same time.

(8) Slide the boot down the shift lever shaft to the floor pan and secure with attaching screws.

2. TRANSMISSION

Removal from the Vehicle

(1) Remove the shift lever boot attaching screws and slide the boot up on the shift lever. Remove the lever attaching bolts and remove the shift lever and boot from the stub lever of the shift housing. On all Valiant Models, disconnect the transmission shift rods.

(2) Drain the lubricant from the transmission.

(3) Disconnect the propeller shaft, speedometer cable, and pinion. **When removing the speedometer cable, care should be used, so as not to crush the housing. Remove by hand.**

(4) Disconnect the left hand exhaust pipe (dual exhaust) from the exhaust manifold.

(5) Disconnect the parking brake control cable.

(6) Disconnect the back-up light switch leads at the connector. (If so equipped.)

(7) Install the engine support fixture C-3487 (or C-3487 and C-3806 depending on Model,) (or a suitable jack) engaging the hooks in the holes in the

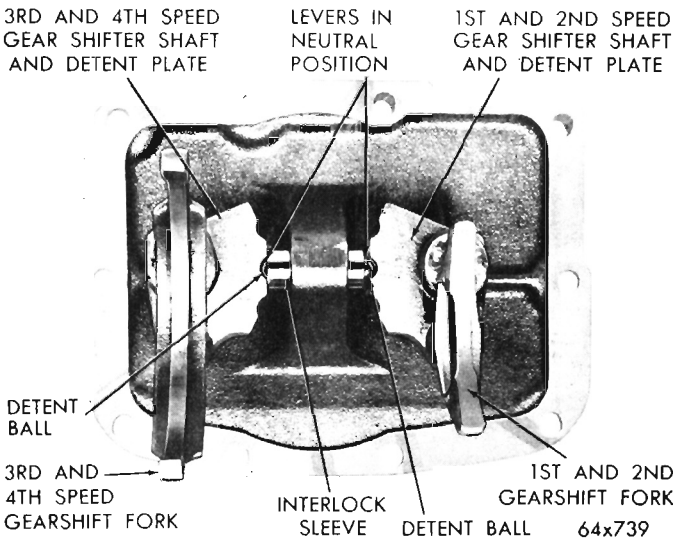
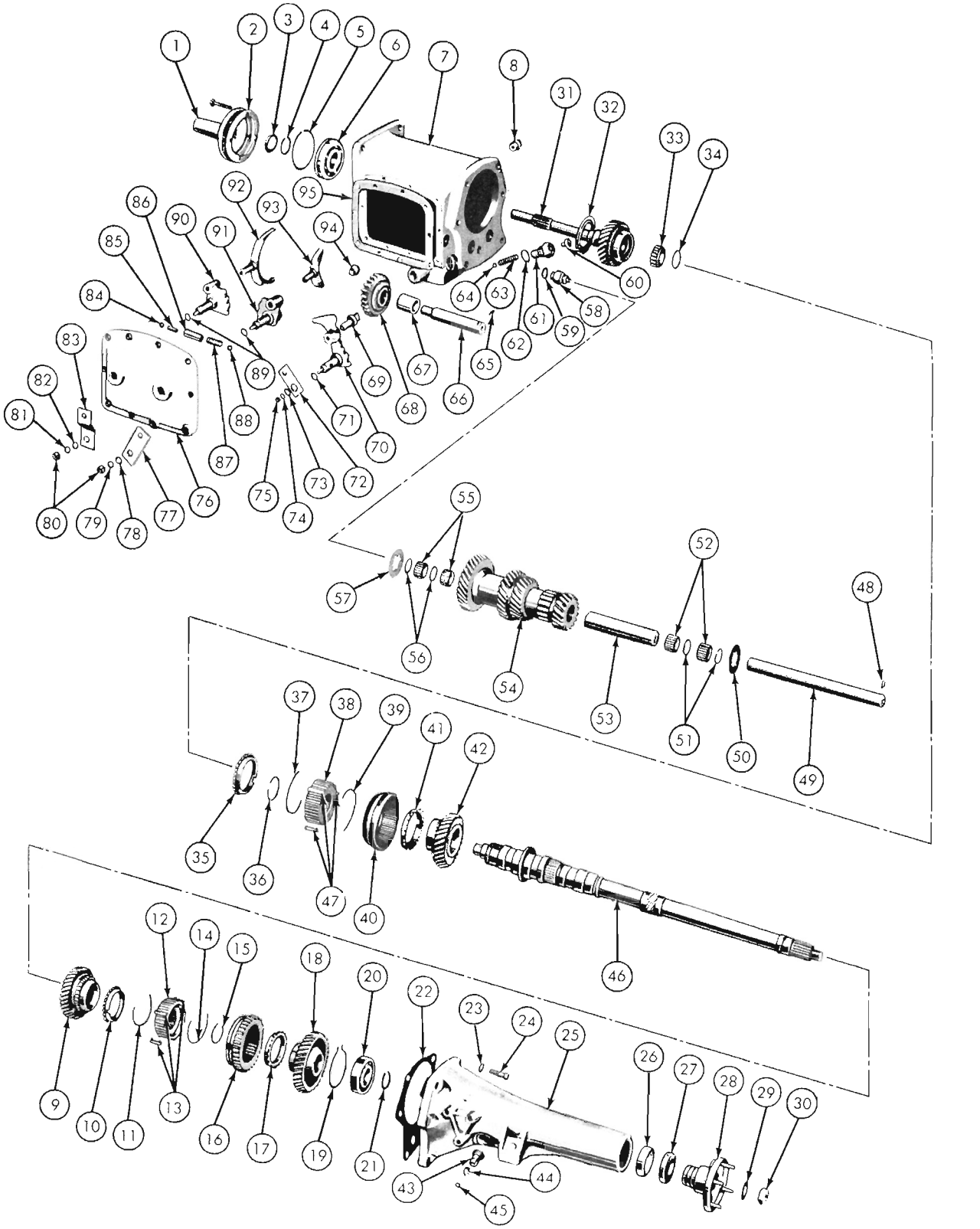


Fig. 5—Transmission Shift Housing Assembly



64 x 740

Fig. 6—Transmission Assembly (Disassembled View)

1. Bearing Retainer
2. Bearing Retainer Gasket
3. Bearing Retainer Oil Seal
4. Snap Ring, Bearing (Inner)
5. Snap Ring, Bearing (Outer)
6. Pinion Bearing
7. Transmission Case
8. Filler Plug
9. Gear, 2nd Speed
10. Stop Ring
11. Shift Plate Springs
12. Clutch Gear
13. Shift Plates (3)
14. Shift Plate Spring
15. Snap Ring
16. 1st and 2nd Clutch Sleeve Gear
17. Stop Ring
18. 1st Speed Gear
19. Bearing Retaining Ring
20. Center Bearing
21. Snap Ring
22. Gasket, Case to Extension Housing
23. Lockwasher
24. Bolt
25. Extension Housing
26. Mainshaft Rear Bearing
27. Rear Bearing Oil Seal
28. Companion Flange
29. Washer
30. Nut
31. Main Drive Pinion
32. Oil Slinger
33. Needle Bearing Rollers
34. Snap Ring
35. Stop Ring
36. Snap Ring
37. Shift Plate Spring
38. Clutch Gear
39. Shift Plate Spring
40. Clutch Sleeve
41. Stop Ring
42. 3rd Speed Gear
43. Speedometer Drive Pinion
44. Speedometer Drive Clip
45. Speedometer Drive Pinion Seal
46. Mainshaft (Output)
47. Shift Plates (3)
48. Woodruff Key
49. Countershaft
50. Thrustwasher, Gear (1)
51. Thrustwasher, Needle Roller Bea
52. Needle Bearing Rollers
53. Bearing Spacer
54. Countershaft Gear (Cluster)
55. Needle Bearing Rollers
56. Thrustwasher, Needle Roller Bea
57. Thrustwasher, Gear (1)
58. Backup Light Switch
59. Backup Light Switch Gasket
60. Plug
61. Retainer, Reverse Detent Ball Sp
62. Gasket
63. Spring, Reverse Detent Ball
64. Ball, Reverse Detent
65. Woodruff Key
66. Reverse Slider Gear Shaft
67. Bushing, Reverse Slider Gear
68. Gear, Reverse Slider
69. Fork, Reverse Shifter
70. Reverse Lever
71. Oil Seal, Reverse Lever Shaft
72. Reverse Operating Lever
73. Flatwasher
74. Lockwasher
75. Nut
76. Gearshift Control Housing
77. 1st and 2nd Operating Lever
78. Flatwasher
79. Lockwasher, Lever
80. Nut, Lever
81. Lockwasher, Lever
82. Flatwasher, Lever
83. 3rd and 4th Operating Lever
84. Detent Ball
85. Detent Ball Spring
86. Detent Ball Sleeve
87. Detent Ball Spring
88. Detent Ball
89. Oil Seal (2)
90. 3rd and 4th Lever
91. 1st and 2d Lever
92. 3rd and 4th Speed Fork
93. 1st and 2nd Speed Fork
94. Drain Plug
95. Gasket, Shift Control Housing

64x740

Fig. 6—Transmission Assembly (Diassembled View)

frame side members. Be sure the support ends are up against the underside of the oil pan flange.

(8) Adjust the fixture (or jack) to support the weight of the engine, then raise the engine slightly and remove the rear crossmember attaching bolts. Remove the crossmember.

(9) Support the transmission, then remove the transmission attaching bolts.

(10) Rotate the transmission until the shift housing and stub lever clear, then slide the transmission toward the rear until the main drive pinion shaft clears the clutch disc, before lowering the transmission. (This will avoid damaging the clutch disc.)

(11) Lower the transmission and remove from under the vehicle. Clean the outside of the case before disassembling.

3. DISASSEMBLING THE TRANSMISSION

To disassemble the transmission for repair or overhaul, refer to Figures 1, 3, 4, 5 and 6.

(1) Mount the transmission in repair stand DD-1014, then disconnect the gearshift control rods from the shift control levers and the transmission operating levers, by removing the spring retainer clips and the flatwashers.

(2) Remove the two gearshift control housing mounting bolts, then remove the gearshift control housing from the transmission extension housing or mounting bracket (if so equipped). Remove the gearshift control housing mounting bracket bolts and remove bracket. (If so equipped.)

(3) Remove the back-up light switch. (If so equipped.)

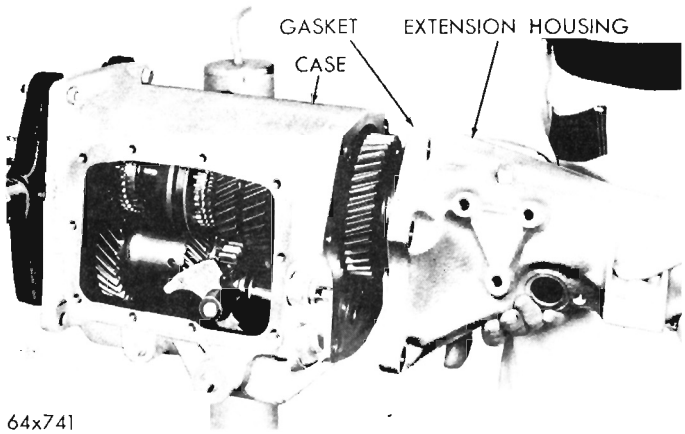
(4) Using a suitable holding tool, remove the companion flange attaching nut and washer, then slide the flange from the end of the mainshaft (output).

(5) Remove the bolts that attach the gearshift housing to the transmission case. With all the levers in the neutral detent position, pull the housing out and away from the case. (The first and second, third and fourth shift fork may remain in engagement with the synchronizer sleeves.) Work the forks out of the sleeves and remove from the case. Discard the housing gasket.

The following three steps need only be done, if oil leakage is visible around the gearshift lever shafts.

(6) Remove the nuts, lockwashers and flatwashers that attach the first and second, third and 4th speed shift operating levers to the shafts. Disengage the shift levers from the flats on the shafts and remove.

(7) Carefully push the gearshift lever shafts out of the housing, allowing the detent balls to fall free. Remove the seals and discard.



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Fig. 7—Removing or Installing the Extension Housing and Mainshaft Assy.

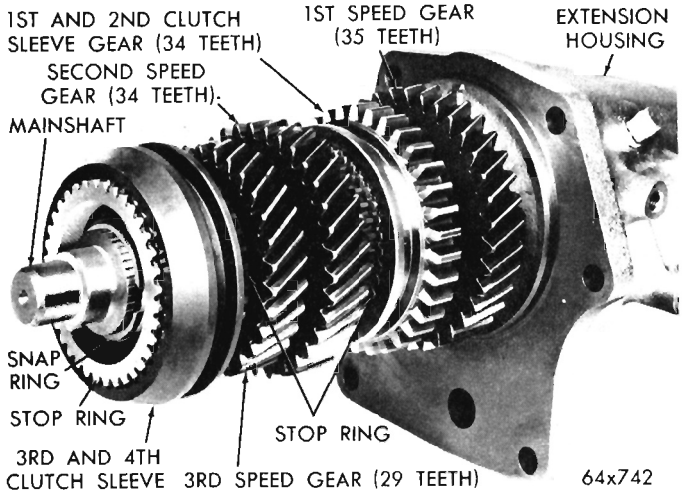


Fig. 8—Mainshaft Gear Identification

(8) Slide the gearshift interlock sleeve, interlock pin and spring out of the housing (Fig. 5).

(9) Remove the main drive pinion bearing retainer attaching bolts, then slide the retainer and gasket from the main drive pinion shaft. Remove the pinion oil seal.

(10) Remove the bolts that attach the extension housing to the transmission case.

(11) Slide the third and fourth synchronizer sleeve slightly forward, then using a soft hammer, tap on the extension housing (in a rearward direction). Slide the housing and mainshaft assembly out and away from the case, as shown in Figure 7.

(12) Refer to Figure 8 for location of the various gears, synchronizer sleeves and clutches before disassembling the mainshaft.

Disassembling the Mainshaft (Fig. 9)

(1) Using a pair of snap ring pliers, remove the snap ring that retains the 3rd and 4th synchronizer clutch gear and sleeve, slide 3rd and 4th synchronizer assembly off the end of the mainshaft.

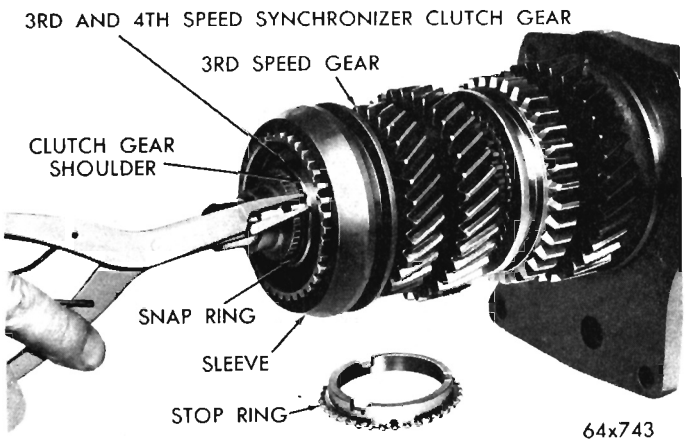


Fig. 9—Disassembling the Transmission Mainshaft

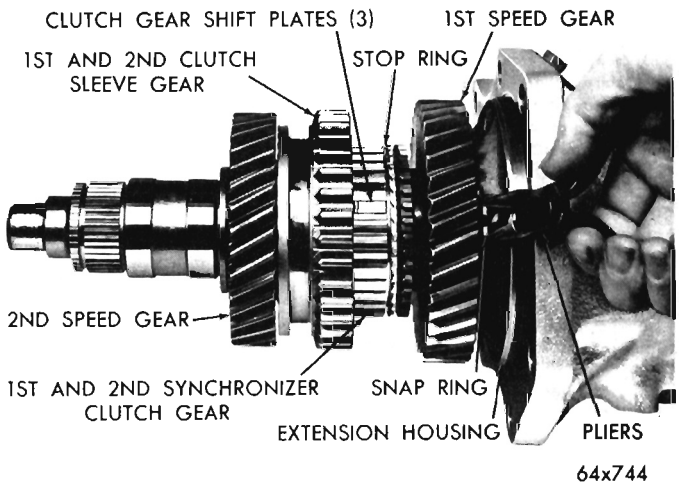


Fig. 10—Removing or Installing Center Bearing Snap Ring

(2) Slide the 3rd speed gear and stop ring off the mainshaft. (Do not separate the 3rd and 4th speed synchronizer clutch gear, sleeve, shift plates or springs unless inspection reveals a replacement part is required.)

(3) Using a suitable pair of long nose pliers, compress the snap ring that retains the mainshaft center bearing in the extension houisng, as shown in Figure 10.

(4) Holding the snap ring compressed, pull the mainshaft assembly and bearing out of the extension housing, as shown in Figure 11. Remove the rear oil seal from the extension housing. Discard the seal.

(5) Remove the rear bearing from the mainshaft by inserting steel plates on the front side of the 1st speed gear, then using an arbor or hammer, press or drive the rear bearing off the mainshaft. (Be careful not to damage the gear teeth.)

(6) Using snap ring pliers, remove the snap ring

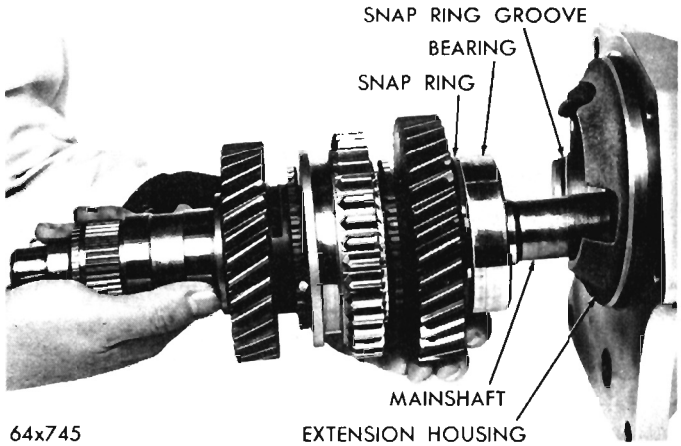


Fig. 11—Removing or Installing the Mainshaft

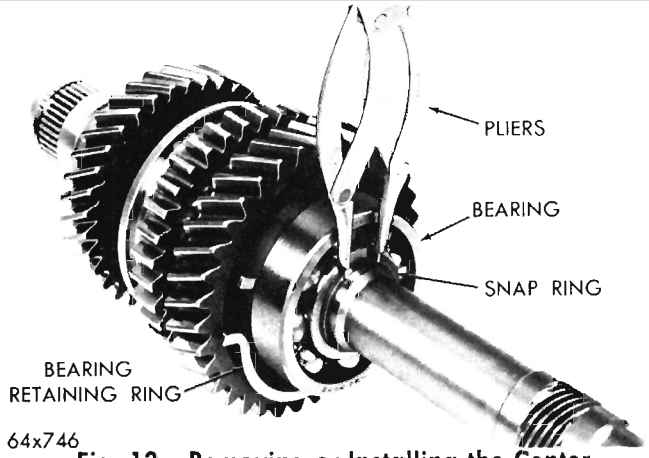


Fig. 12—Removing or Installing the Center Bearing Snap Ring

that retains the mainshaft bearing on the shaft, as shown in Figure 12. Remove the bearing, bearing retainer ring, 1st speed gear, and first speed stop ring.

(7) Again using snap ring pliers, remove the snap ring that retains the 1st and 2nd clutch sleeve gear and clutch to the mainshaft, as shown in Figure 13. Slide the 1st and 2nd clutch sleeve gear and clutch from the mainshaft. (Do not separate the clutch sleeve gear and the clutch, unless inspection reveals a replacement part is required.)

Figure 14 shows the various mainshaft bearing surfaces of the gears. Inspect these surfaces for signs of wear, scoring, or any condition that would not allow the shaft to be used at reassembly. (See Cleaning and Inspection.)

Figure 15 shows the reverse gear shift fork, the reverse sliding gear, the reverse sliding gear shaft and the cluster gear.

(8) Using a shim stock feeler gauge, measure the end play of the countershaft gear, by inserting the gauge between the thrust washer and the gear, as shown in Figure 16. This measurement should not exceed .0045 to .028″. If measurement is greater than that specified, new thrust washers must be installed at reassembly.

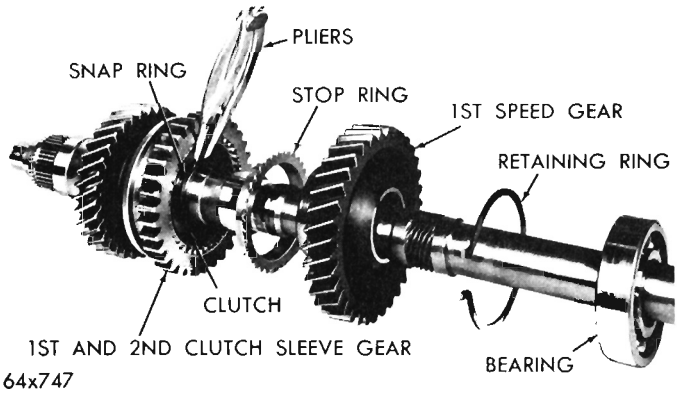


Fig. 13—Removing or Installing Clutch Gear Snap Ring

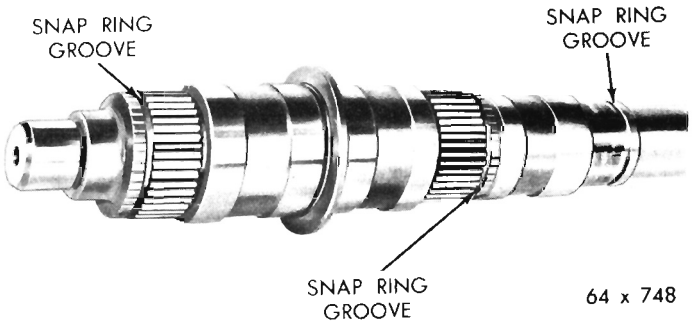


Fig. 14—Mainshaft Bearing Surfaces

(9) Using a suitable drift, drive the reverse slider gear shaft (from front to rear) far enough out of the case to remove the reverse slider gear, as shown in Figure 17. Remove the woodruff key from the shaft. Remove the shaft from the case.

(10) Remove the reverse gearshift lever detent

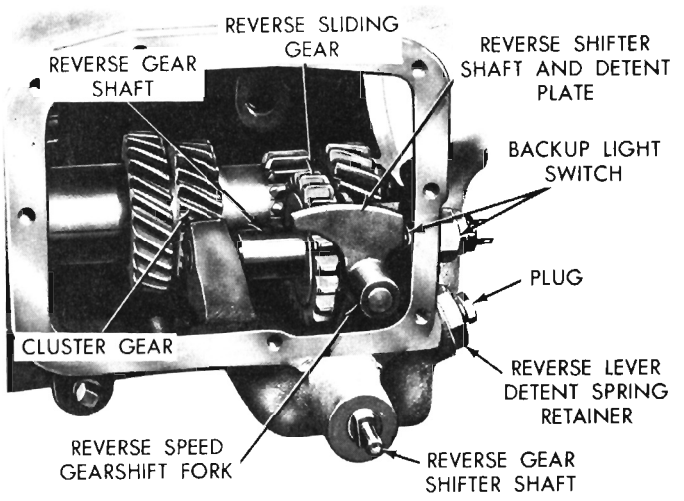


Fig. 15—Gear, Shaft and Lever Identification

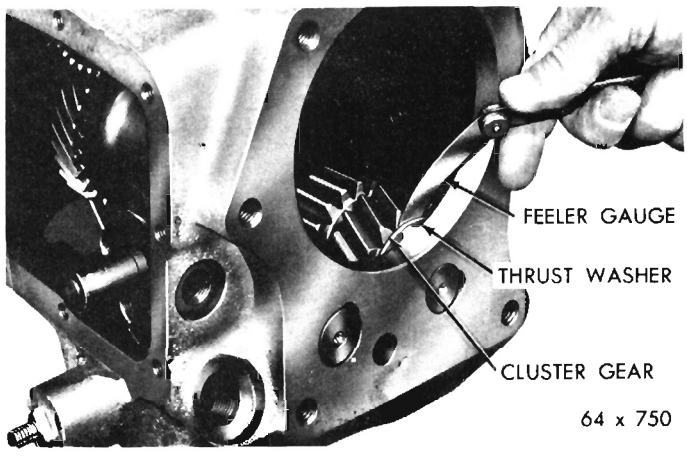


Fig. 16—Measuring the Cluster (Countershaft) Gear End Play

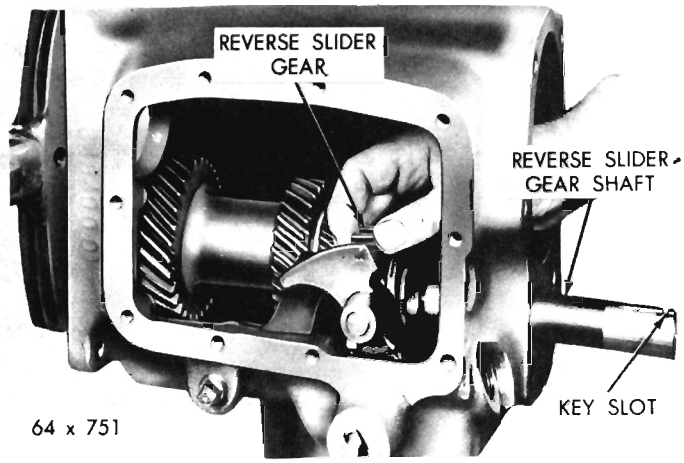


Fig. 17—Removing or Installing the Reverse Slider Gear

spring retainer, gasket, plug and detent ball spring from the rear of the case (Fig. 15).

The following step need only be done if oil leakage is visible around the reverse gearshift lever shaft.

(11) Carefully push the reverse gearshift lever shaft into the case, and remove from the case, as shown in Figure 18. Lift out the detent ball from the bottom of the case. Remove the shift fork from the shaft and detent plate.

(12) Using countershaft arbor C-3938, and a plastic hammer, drive the countershaft out of the case, allowing the countershaft gear to be lowered to the bottom of the case. (This will permit the removal of the main drive pinion.)

(13) Using a pair of snap ring pliers, remove the main drive pinion bearing outer snap ring, using a plastic hammer, drive the main drive pinion into the case and remove.

(14) Using snap ring pliers, remove the main drive pinion bearing inner snap ring. Using an arbor press, remove the bearing from the main drive pinion.

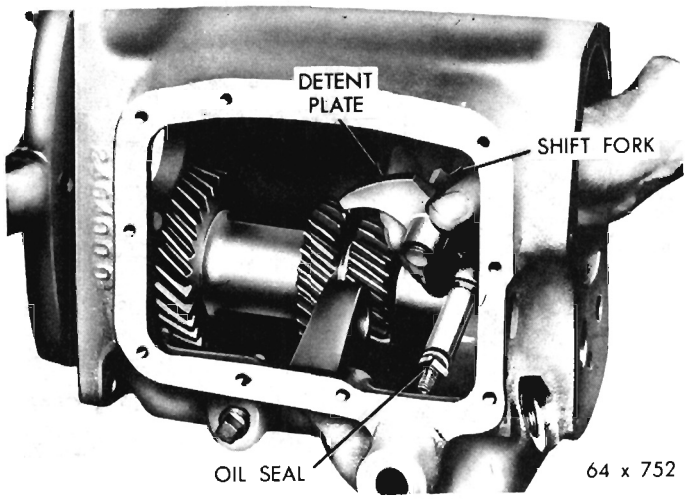


Fig. 18—Removing or Installing the Reverse Shift Fork and Lever

(15) Remove the countershaft gear (cluster) from the bottom of the case, as shown in Figure 19.

(16) Remove the arbor and the 76 needle type bearings, thrust washers and spacer, from the center of the countershaft gear.

Cleaning and Inspection
Transmission Case

Clean the transmission case thoroughly, using a suitable solvent, dry with compressed air. Inspect the case for cracks, stripped threads in the various bolt holes and the machined mating surfaces for burrs, nicks or any condition that would render the case unfit for further service. The front mating surface should be smooth; if any burrs are present, dress them off with a fine mill file. If threads are stripped, install Helicoil inserts.

Ball Bearings

Wash the ball bearing, using a clean solvent and blow dry with compressed air.

CAUTION: Do not spin the bearings with air pressure; turn slowly by hand. Spinning unlubricated bearings may cause damage to the races and the balls. Be sure the ball bearings are clean, then lubricate them with light grade engine oil. Inspect the bearings for roughness. This can best be determined by slowly turning the outer race by hand. Measure the fit of the bearings on their respective shafts.

Needle Type Bearing Rollers and Spacers

Inspect the main drive pinion and countershaft gear bearing rollers for flat spots or brinelling. Inspect the countershaft bearing roller spacers for signs of wear or galling. Install new parts as required.

Gears

Inspect the gear teeth on the synchronizer clutch gears and stop rings. If there is evidence of chipping or excessively worn teeth, install new parts at reassembly. Be sure the clutch sleeve slides easily on the clutch gear. Inspect the teeth on the second and third speed gears and the first speed gear for chipped or broken teeth, or showing signs of excessive wear. Small nicks or burrs must be stoned off.

Inspect the teeth on the main drive pinion. If excessively worn, broken or chipped, a new pinion should be installed.

Test the interlock sleeve and pin for free movement in the bore of the shift housing. Examine the detent balls for signs of brinelling. If the lever detents show signs of excessive wear to the extent of not locking in gear, install a new part. Inspect the shift forks for wear on the shanks and pads.

Synchronizer Stop Rings

Inspect the stop rings for cracks at the corners of the shift plate indexing slots. If the rings are cracked or show signs of extreme wear on the threaded bore, install new rings at reassembly.

Mainshaft (Output)

Refer to Figure 14 and inspect the mainshaft gear and bearing mating surfaces. If the gear contact surfaces show signs of galling or excessively worn, a new mainshaft should be installed.

Inspect the snap ring grooves for burred edges. If rough or burred, remoge the condition using a fine file or crocus cloth. Inspect the synchronizer clutch gear teeth on the shaft for burrs.

4. ASSEMBLING THE TRANSMISSION

To reassemble the transmission, refer to Figures 1, 4 and 6.

Countershaft Gear (Cluster) (Fig. 6)

(1) Using heavy grease, coat the inside of the bore of the gear at each end, then install the roller bearing spacer; centered. Insert arbor Tool C-3938, into the gear and through the spacer. Center the arbor.

(2) Coat the needle type roller bearings with heavy grease, then at each end of the gear, install 19 rollers, followed by a spacer ring and 19 more roller bearings and 1 spacer ring. (Refer to Fig. 2.)

(3) Coat the thrustwasher with heavy grease and install them over the arbor with the tang side toward the case boss, as shown in Figure 20.

(4) Install the countershaft gear assembly into the case, as shown in Figure 19. Allow the gear assembly to rest on the bottom of the case. (Be sure the thrustwashers stay in position.)

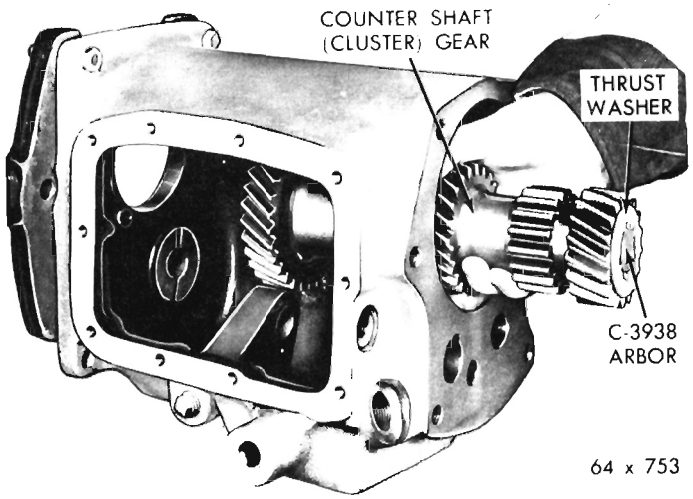


Fig. 19—Removing or Installing the Cluster Gear and Arbor

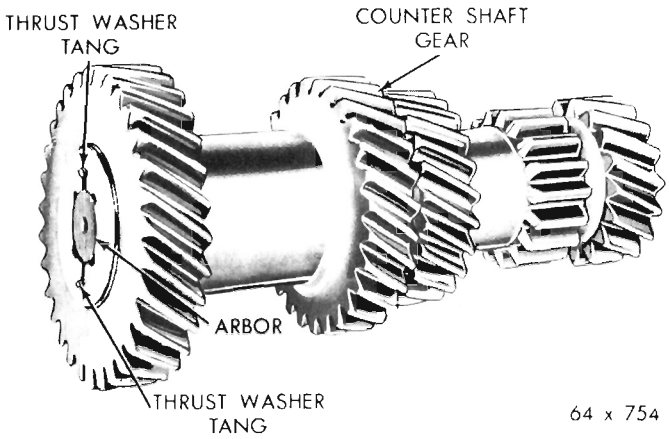


Fig. 20—Cluster Gear and Arbor Assembly

Mainshaft

(1) Slide the second speed gear over the mainshaft (synchronizer cone toward the rear) and down into position against the shoulder on the shaft (See Figure 13).

(2) Slide the first and second clutch sleeve gear assembly including 2nd gear stop ring) over the mainshaft (with the shift fork slot toward the front) and down into position against the second speed gear. (Be sure the stop ring is indexed with the shift plates.) Install a new snap ring to secure. (Fig. 13).

(3) Slide the low gear stop ring over the shaft and down into position and index with the shift plates.

(4) Slide the first speed gear (synchronizer cone toward the clutch sleeve gear just installed) over the mainshaft and down into position against the clutch sleeve gear.

(5) Install the mainshaft bearing retaining ring, followed by the mainshaft center bearing. Using an arbor and a suitable tool, drive or press the bearing down into position. Install a new snap ring to secure (refer to Figure 12).

(6) Slide the rear bearing over the mainshaft and drive or press into position.

(7) Install the partially assembled mainshaft into the extension housing far enough to engage the retaining ring in the slot in the extension housing (See Figure 11). Compress the retaining ring and at the same time seat the mainshaft in the extension housing. (Refer to Figure 10.) (Be sure retaining ring is seated all around its slot.)

(8) Slide the third speed gear over the mainshaft (with the synchronizer cone toward the front) followed by the third gear stop ring.

(9) Install the third and fourth speed synchronizer clutch gear assembly (including sleeve, shift plates

and springs) on the mainshaft (shift fork slot toward the rear) down against the third speed gear. Be sure and index the rear stop ring with the clutch gear shift plates (Refer to Figure 9).

(10) Install the retaining snap ring as shown in Figure 9, then, using heavy grease, position the front stop ring over the clutch gear, again indexing the ring slots with the shift plates. (Refer to Fig. 8.)

CAUTION: It is very important that the indexing of all stop rings and the positioning of the gears and clutches on the mainshaft be correct, or the mating of the extension housing to the case will not be possible without damage.

Main Drive Pinion (Fig. 21)

(1) Slide the bearing oil slinger over the main drive pinion shaft, then press the main drive pinion bearing on the pinion shaft. (Be sure the outer snap ring groove is toward the front.) Seat the bearing fully against the shoulder on the gear.

(2) Install a new inner snap ring into the groove to retain the bearing. Be sure the snap ring is seated.

(3) Install the main drive pinion and bearing in the case and into position in the front bore. Tap lightly into place, using a plastic hammer. Install the outer snap ring in the bearing groove.

(4) Start the countershaft in its bore at the rear of the case. Raise the countershaft gear until the teeth mesh with the main drive pinion gear. (Be sure the thrust washers remain in position on the ends of the arbor and the tangs aligned with the slots in the case.)

(5) Align the countershaft arbor with the bores in the case, then drive or press the countershaft into the gear. Install the woodruff key. Continue to press the shaft into the case until the end of the shaft is flush with the rear face of the case. Remove arbor Tool C-3938.

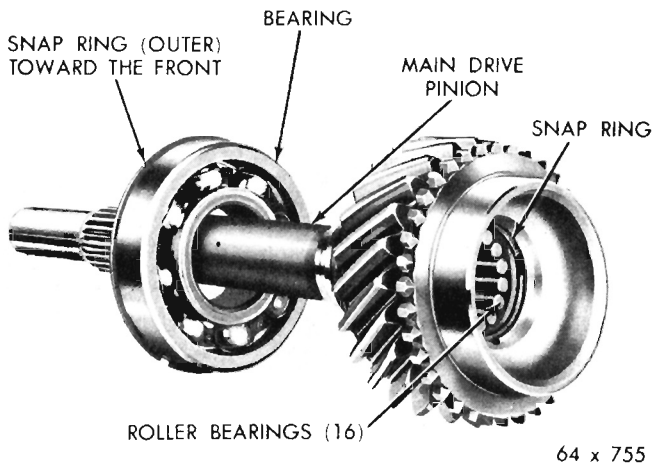


Fig. 21—Main Drive Pinion and Bearing Assembly

Testing the Countershaft Gear End Play

Using a shim stock feeler gauge, measure the end play of the countershaft by inserting the feeler gauge between the thrust washer and the gear (Fig. 16). This measurement should not exceed .0045 to .028 inch.

The following step need only be done if the reverse shaft was removed because of oil leak.

(1) Install a new oil seal on the reverse gearshift lever shaft and coat with Lubriplate. Carefully install the lever shaft into the bore in the case and position (Fig. 18). Install the reverse fork in the lever.

(2) Install the reverse shift detent ball and spring. Install the reverse detent ball spring retainer gasket and retainer Tighten securely.

(3) Position the reverse slider gearshaft in position in the end of the case, and drive in far enough to position the reverse slider gear on the protruding end of the shaft with the shift slot toward the rear (Fig. 17). At the same time, engage the slot with the reverse shift fork.

(4) With the reverse slider gear correctly positioned, drive the reverse gear shift into the case far enough to be able to install the woodruff key. Drive the shaft into position, flush with the end of the case (Fig. 15).

(5) Install the back-up light switch and gasket (if so equipped), and tighten securely.

Installing the Extension Housing and Mainshaft Assembly

(1) Coat a new extension housing to case gasket with grease (both sides) then place in position on the case.

(2) Center the reverse slider gear on its shaft, then carefully insert the mainshaft assembly into the case (Fig. 7). Be sure the third and fourth speed stop ring is indexed with the shifter plates.

(3) Move the third and fourth speed clutch sleeve slightly toward the front and at the same time align the end of the mainshaft with the main drive pinion. Push in on the extension housing and bottom against the case and gasket.

(4) Install the attaching bolts and tighten securely.

(5) Move the reverse slider gear ahead to the neutral position.

Transmission Gearshift Housing

The following 4 steps need only be done if the gearshift housing was disassembled previously because of leaking seals.

(1) Slide the interlock sleeve into position in the housing. Coat a new seal with Lubriplate, then slide over a shift shaft and down into its groove.

(2) Install the gearshift lever shaft in position in the housing, then install the gearshift operating lever on the flats of the shaft (lever pointing upward, refer to Figure 1). Install a flatwasher, lockwasher and nut. Tighten securely.

(3 Place a detent ball in the sleeve, followed by the poppet spring and interlock pin. Start the remaining lever shaft into the housing, after installing the shaft seal as mentioned previously. Install the operating lever on the flats of the shaft (lever pointing upward) and secure with flatwasher, lockwasher and nut. Tighten the nut securely.

(4) Place the remaining detent ball on the poppet spring, then compress the ball and the spring, using a small screwdriver. Push the shafts in until seated. Turn the shafts until the balls drop into the neutral position detent. (See Fig. 5.)

(5) Place the transmission assembly on its side with the gearshift housing cover opening up. Install a shift fork in each synchronizer sleeve collar, and with both sleeves in the neutral position, install the shift housing and a new gasket. (Line up the shift fork ends with the shaft in the housing.)

(6) Install the attaching bolts and tighten evenly to avoid distortion of the housing (center bolt on each side are pilot bolts and should be installed first).

(7) Using Tool C-3789, install a new oil seal in the retainer bore. Install the main drive pinion bearing retainer and gasket. Install the attaching bolts and tighten from 30 to 35 foot-pounds torque.

(8) Install the gearshift control assembly and the shift rods (Fig. 3), in correct position and secure with washers and clips on Valiant Models only.

(9) Install the propeller shaft companion flange on end of mainshaft. Install washer and nut and tighten to 175 foot-pounds torque.

5. INSTALLING THE TRANSMISSION

Before installing the transmission, a test of the clutch housing bore and face alignment should be made. (Refer to the "Clutch" Group 6 for the service procedure.)

Place a small amount of short fibre wheel bearing lubricant around the inner end of the main drive pinion shaft pilot bushing in the flywheel and on the pinion bearing retainer release bearing sleeve area.

NOTE: Do not lubricate the end of the pinion shaft, the clutch disc splines or the clutch release levers.

(1) Remove the transmission from the repair stand and install the rear crossmember and support, then roll under the vehicle, using a suitable transmission jack.

(2) Raise the transmission until the main drive pinion is centered in the clutch housing bore.

(3) Roll the transmission slowly forward until the pinion shaft enters the clutch disc, then drop the jack. Turn the pinion shaft until the splines are aligned, then work the transmission forward until seated against the clutch housing.

NOTE: Do not allow the transmission to "hang" after the pinion shaft has entered the clutch disc.

(4) Install the transmission attaching bolts and tighten to 50 foot-pounds torque.

(5) Using a pointed drift, align the crossmember bolt holes and then install the attaching bolts. Tighten to 50 foot-pounds torque.

(6) Remove the engine support fixture and disengage the hooks from the holes in the frame side rails.

(7) Install the speedometer drive pinion and cable. Connect the back-up light switch wires (if so equipped).

(8) Reconnect the parking brake cable and propeller shaft.

(9) Reconnect the exhaust pipes (if removed). Tighten bolts securely. Reconnect the transmission shift rods (on Valiant Models only.)

(10) Fill the transmission with 7½ pints of Type "A" Suffix "A" lubricant or until the oil just dribbles out of the filler hole.

(11) Install the gearshift lever (and boot) to the stub lever on the shift housing and secure with bolts. Tighten securely.

(12) Slide the boot down the shift lever to the floor pan and secure with screws.

(13) Road test the vehicle to make sure the transmission shifts smoothly and operates quietly.

6. SERVICING THE REAR OIL SEAL

(1) Disconnect the propeller shaft at the transmission flange and secure the shaft to the frame member for working clearance.

(2) Hold the mainshaft with Tool C-3281, then remove the flange nut and washer.

(3) Remove the transmission flange, using Tool C-452 if necessary.

(4) Remove the oil seal, using Tool C-748.

(5) Drive a new seal into the extension housing, using Tool C-3837.

(6) Install the transmission flange, washer and nut. Tighten nut to 175 foot-pounds torque.

(7) Reconnect the propeller shaft and tighten the flange nuts to 30 foot-pounds torque.

SPEEDOMETER PINION USAGE CHART
(4 Forward Speed Manual Transmission)

Tire Size	Axle Ratio	Output Shaft Teeth	Pinion Teeth	Color
6.50x13	2.93	8	19	Dark Blue*
	3.23	8	21	Gray
	3.55	8	19	Dark Blue
	3.91	8	21	Gray
7.00x14	2.93	8	18	Dark Purple
	3.23	8	20	Green
	3.55	8	18	Dark Purple
7.50x14	2.93	8	18	Dark Purple
	3.23	8	19	Dark Blue
	3.55	8	21	Gray
	3.91	8	19	Dark Blue*

*Use .9058:1 Adaptor.

1C—SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
Hard Shifting	(a) Incorrect clutch adjustment.	(a) Refer to the Clutch Group for corrections.
	(b) Improper cross-over adjustment.	(b) Perform the cross-over adjustment as outlined in Paragraph "Gearshift Linkage Adjustments".
	(c) Synchronizer clutch sleeve damaged.	(c-d-e) Causes noted can only be corrected by disassembling the transmission and replacing damaged or worn parts.
	(d) Synchronizer spring improperly installed.	
	(e) Broken or worn synchronizer stop rings.	
Transmission Slips Out of Gear	(a) Linkage interference.	(a) Inspect and remove all linkage interferences.
	(b) Gearshift rods out of adjustment.	(b) Adjust the gearshift rods as outlined in Paragraph "Gearshift Linkage Adjustments".
	(c) Second or direct speed gear synchronizer clutch teeth worn.	(c) Disassemble the transmission and replace parts as necessary.
	(d) Clutch housing bore or face out of alignment.	(d) Refer to the Clutch Group for correction procedures.
Transmission Noises Backlash Noise	(a) Excessive end play in the cluster gear.	(a) Replace the worn gear.
	(b) Loose synchronizer hub spline fit on mainshaft.	(b) Inspect the mainshaft and synchronizer hub and replace parts as necessary.
	(c) Loose spline fit on low speed sliding gear to mainshaft spline.	(c) Inspect the low speed sliding gear and mainshaft. Replace parts as necessary.
	(d) Loose spline fit of rear mainshaft flange.	(d) Inspect the mainshaft and flange splines. Replace parts as necessary.
	(e) Damaged, broken or excessively worn gear teeth.	(e) Replace the worn gears.
	(f) Drive pinion bearing worn.	(f) Replace the worn bearing.

PART 2 - TORQUEFLITE TRANSMISSION (TORQUE CONVERTER)

2A—SPECIFICATIONS

	Torqueflite For Six Cylinder Models	Torqueflite For Eight Cylinder Models
TYPE	Automatic Three Speed with Torque Converter	
TORQUE CONVERTER DIAMETER	10¾ inches	11¾ inches
OIL CAPACITY—TRANSMISSION AND TORQUE CONVERTER (Dry Fill)	18 pints	20 pints
	Automatic Transmission Fluid Type "A", Suffix "A"	
COOLING METHOD	Water-Heat Exchanger	
LUBRICATION	Pump (Rotor Type)	
CLUTCHES		
Number of Front Clutch Plates	3 (170 Cu. In. Eng.)	4
	4 (225 Cu. In. Eng.)	—
Number of Front Clutch Discs	3 (170 Cu. In. Eng.)	4
	4 (225 Cu. In. Eng.)	—
Number of Rear Clutch Plates	2	2 (6 Cyl. Police Cars & Taxi Cabs)
	—	2 (318 Cu. In. Eng.)
	—	3 (361-383-426-Cu. In. Eng.)
Number of Rear Clutch Discs	3	3 (6 Cyl. Police Cars & Taxi Cabs)
	—	3 (318 Cu. In. Eng.)
	—	4 (361-383-426-Cu. In. Eng.)
GEAR RATIOS		
1—Low	2.45 to 1	
2—Second	1.45 to 1	
D—Drive	1 to 1	
R—Reverse	2.20 to 1	
N—Neutral	—	
FRONT—REAR PUMPS		
Type	Gear (Rotary)	
End Clearance	Front— .001 to .0025"	
	Rear—.0015 to .003"	
DRIVE TRAIN END PLAY	.024 to .068 inch	.030 to .069 inch
CLUTCH PLATE CLEARANCE		
Front Clutch	.042 to .087" (3 Disc Clutch)	.024 to .123 inch
	.056 to .104" (4 Disc Clutch)	—
Rear Clutch	.018 to .036 inch	.022 to .042" (3 Disc Clutch)
	—	.026 to .054" (4 Disc Clutch)
SNAP RINGS		
Front and Rear Clutches		
Rear Snap Ring (Selective)	.060 to .062 inch	.060 to .062 inch
	.068 to .070 inch	.074 to .076 inch
	.076 to .078 inch	.088 to .090 inch
Output Shaft Bearing	—	.086 to .088 inch
THRUST WASHERS		
Output Shaft to Input Shaft (Selective)	.052 to .054 inch	—
	(Natural)	—
	.068 to .070 inch	—
	(Red)	—
	.083 to .085 inch	—
	(Black)	—

SPECIFICATIONS—(Continued)

	Torqueflite For Six Cylinder Models	Torqueflite For Eight Cylinder Models
THRUST WASHERS		
Reaction Shaft Support to Front Clutch Retainer (Selective)	—	.043 to .045 inch
	—	(Natural)
	—	.061 to .063 inch
	—	(Green)
	—	.084 to .086 inch
	—	(Red)
Sun Gear Driving Shell	.060 to .062 inch	—
Driving Shell (Steel)	.034 to .036 inch	—
Overrunning Clutch Race	.060 to .062 inch	—
Kickdown Annulus Support	.121 to .125 inch	—
Front Clutch to Rear Clutch	.043 to .045 inch	—
Front Clutch to Reaction Shaft Support	.043 to .045 inch	—
Output Shaft to Input Shaft	—	.062 to .064 inch
Sun Gear Driving Shell Thrust Plate (Steel)	—	.034 to .036 inch
Rear Planetary Gear to Driving Shell	—	.062 to .064 inch
Front Planetary Gear to Annulus Gear Support	—	.062 to .064 inch
Front Annulus Gear Support to Driving Shell	—	.062 to .064 inch
Front Clutch Piston Retainer to Rear Clutch Piston Retainer	—	.061 to .063 inch (Green)

SPECIAL TOOLS

6 and 8 Cyl. Vehicles

C-452	Puller—Companion Flange
C-484	Pliers—Snap Ring
C-763	Switch—Remote Control Starter
C-3203A	Jack—Transmission
C-3229	Pliers—Snap Ring
C-3281	Wrench—Companion Flange Holding
C-3288	Studs—Pilot
C-3292	Gauge—Low Pressure
C-3293	Gauge—High Pressure
C-3335	Straight Edge
C-3339	Dial Indicator
C-3422	Compressor—Engine Valve Spring
C-3705	Adapter—Transmission Band Adjuster (Use with C-3380 Torque Wrench)
C-3749	Stand—Valve Body
C-3752	Remover—Front Oil Pump and Reaction Shaft Support
C-3763	Gauge—Throttle Pressure Setting
C-3765	Installer—Shifter Shaft Detent Ball
C-3887	Kit—Service Bushing Removing and Installing

6 Cyl. Vehicles

C-3283	Studs—Pilot
C-3575	Compressor—Front Clutch Piston Spring
C-3750	Stand—Transmission
C-3751	Installer and Burnisher—Extension Housing Bushing
C-3753	Remover—Output Shaft Oil Seal

SPECIAL TOOLS—Continued

C-3754	Driver—Output Shaft Oil Seal
C-3755	Remover—Extension Housing Bushing
C-3756	Aligning Tool—Front Oil Pump
C-3757	Installer—Front Pump Oil Seal
C-3758	Remover—Front Pump Oil Seal
C-3759	Assembly Tool—Front Oil Pump to Reaction Shaft Support
C-3760	Compressor—Rear Clutch Piston Spring
C-3762	Aligning Sleeve—Rear Oil Pump Cover
C-3768	Protector—Output Shaft Oil Seal
C-3809	Fixture—Engine Lifting
C-3899	Remover—Output Shaft Oil Seal Rubber Lip
8 Cyl. Vehicles	
C-748	Remover—Output Shaft Oil Seal
C-3204	Driver—Output Shaft Bearing
C-3275	Remover—Output Shaft Bearing
C-3487	Fixture—Engine Support
C-3750	Stand—Transmission
C-3837	Driver—Output Shaft Oil Seal
C-3860	Driver—Front Pump Oil Seal
C-3861	Remover—Front Pump Oil Seal
C-3863	Compressor—Front Clutch Piston Spring Installer—Overrunning Clutch Cam
C-3864	Aligning Sleeve—Rear Oil Pump Cover
C-3881	Aligning Tool—Front Oil Pump Rotor
C-3882	Adapter Kit—Use with C-3750 Transmission Stand

TORQUE REFERENCE—TORQUEFLITE

	Foot-Pounds	Inch-Pounds
Kickdown Band Adjusting Screw Lock Nut (Eight Cylinder Cars)	29	—
Kickdown Band Adjusting Screw Lock Nut (Six Cylinder Cars)	25	—
Kickdown Lever Shaft Plug	—	150
Reverse Band Adjusting Screw Lock Nut (Eight Cylinder Cars)	35	—
Reverse Band Adjusting Screw Lock Nut (Six Cylinder Cars)	20	—
Cooler Line Fitting	—	75
Control Cable Adjusting Wheel Bolt	—	40
Converter Drain Plug	14	—
Converter Drive Plate to Crankshaft Bolt	55	—
Converter Drive Plate to Torque Converter Bolt	—	270
Extension Housing to Transmission Case Bolt	24	—
Extension Housing to Insulator Mounting Bolt	35	—
Extension Housing—Crossmember to Frame Bolt	75	—
Front Oil Pump Housing to Transmission Case Bolt	—	150
Governor Body to Parking Sprag Bolt	—	100
Neutral Starter Switch—Initial Contact + ¼ to ⅜ turn	60 Maximum	—
Neutral Starter Switch (Console Shift only)	25-30	—
Oil Filler Tube Bracket Bolt	—	150
Oil Pan Bolt	—	150
Output Shaft Flange Nut	175	—
Overrunning Clutch Cam Set Screw	—	40
Parking Lock Cable Locking Bolt	—	10
Parking Sprag Cover Bolt	—	150
Pressure Test Take-off Plug	—	75
Reaction Shaft Support to Front Oil Pump Bolt	—	150
Rear Oil Pump Cover Bolt	—	140
Transmission to Engine Bolt	25-30	—
Valve Body Screw	—	28
Valve Body to Transmission Case Bolt	—	100
Speedometer Cable Clamp Screw	—	150

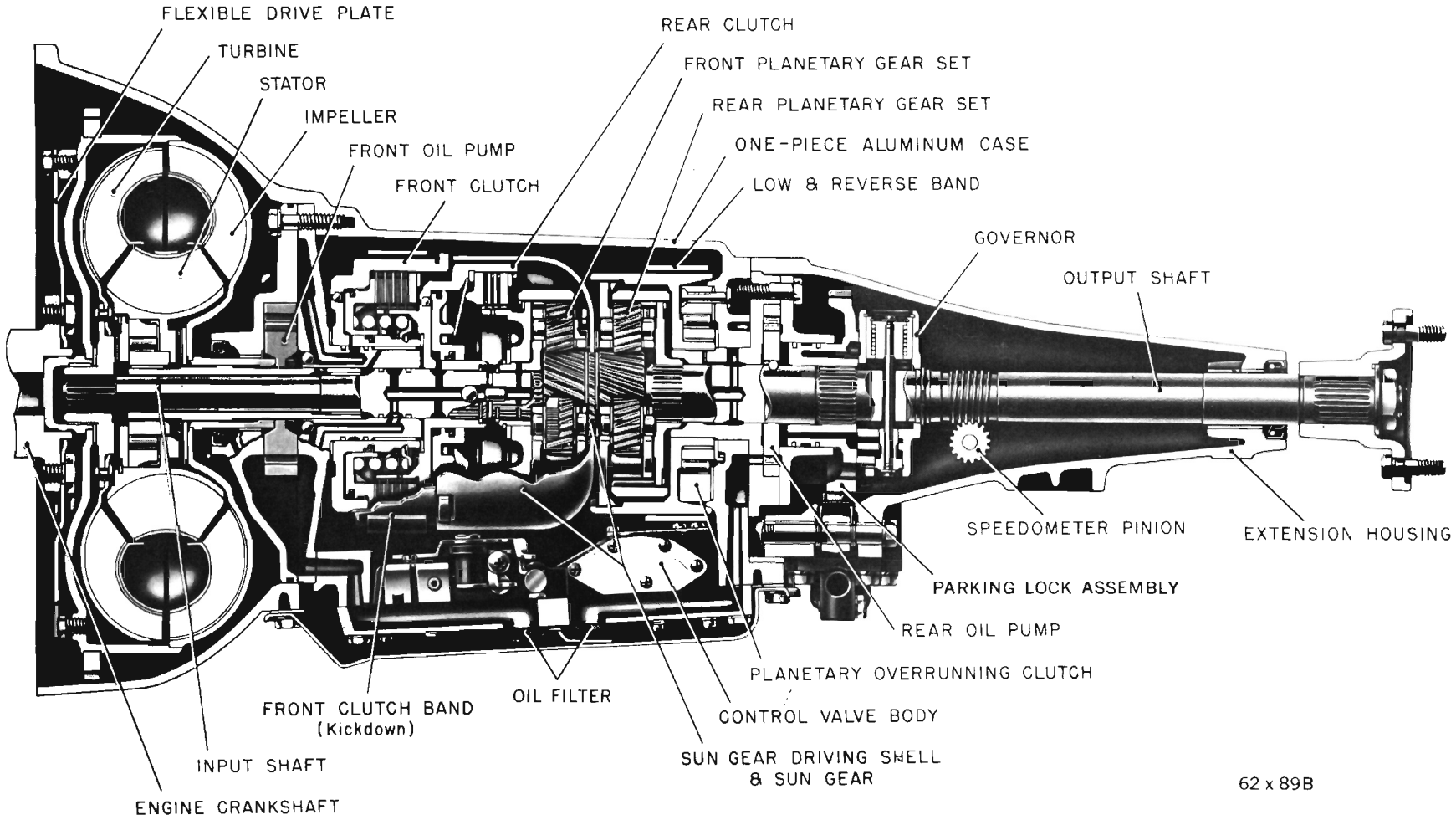


Fig. 1—TorqueFlite Transmission and Torque Converter For Six Cylinder Cars

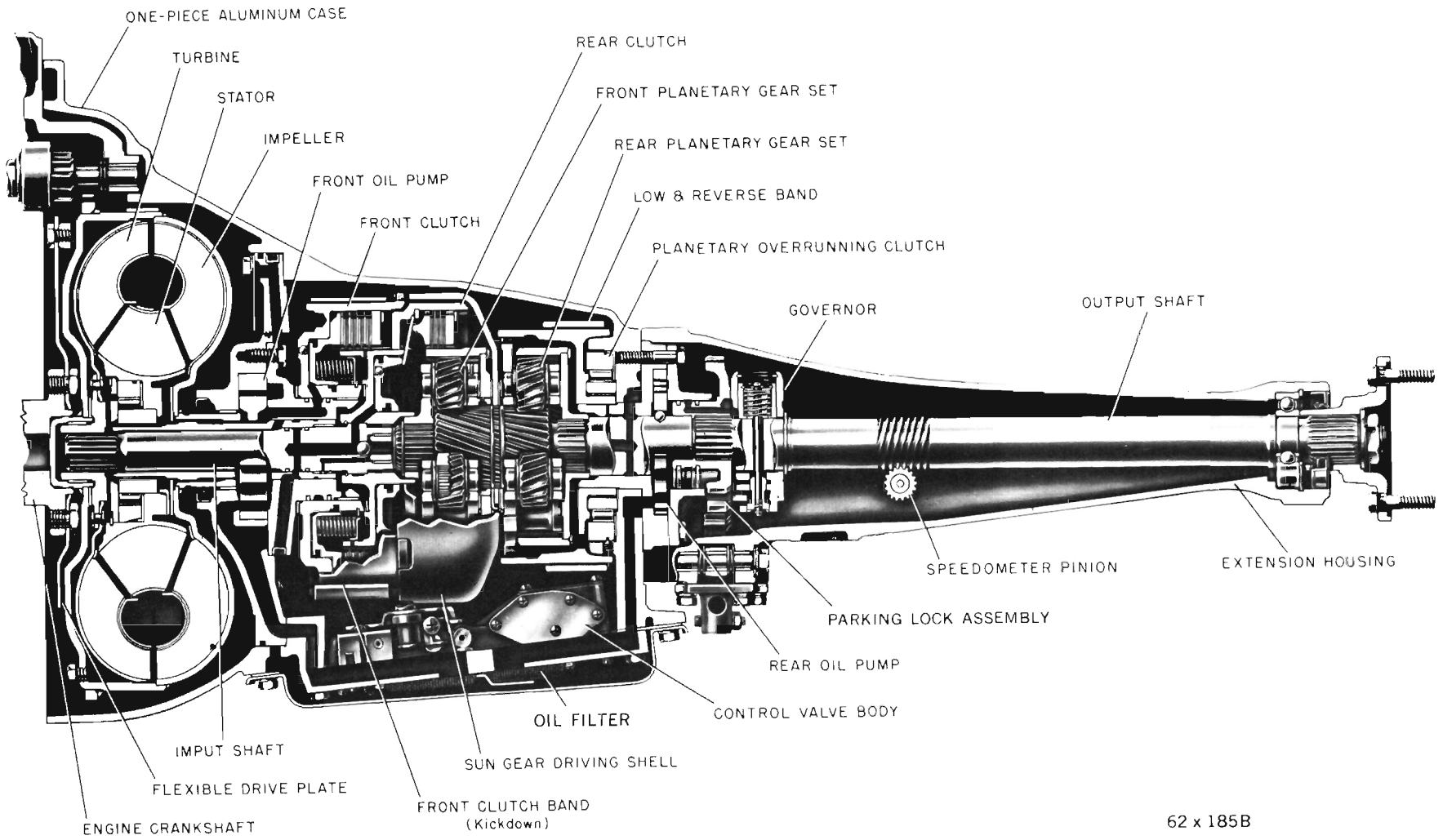


Fig. 2—TorqueFlite Transmission and Torque Converter For Eight Cylinder Cars

TORQUEFLITE TRANSMISSION

GENERAL INFORMATION

The (A-904) TorqueFlite Transmission is used in all vehicles equipped with six cylinder engines except Police Cars and Taxi Cabs. The number of front clutch plates, extension housing length and mounting pad location are different, depending on the engine usage. Refer to Specifications for front clutch plate information.

The (A-727) TorqueFlite Transmission is used in all vehicles equipped with eight cylinder engines, and is available for the six cylinder engine Police Cars and Taxi Cabs. The number of rear clutch plates, extension housing length and mounting pad location, and transmission case front mounting flange are different, depending on the engine usage. Refer to Specifications for rear clutch plate information.

The transmission combines a torque converter with a fully-automatic 3-speed gear system (Figs. 1 and 2). The torque converter housing and transmission case are an integral aluminum casting. The transmission consists of two multiple disc clutches, an overrunning clutch, two servos and bands, and two planetary gear sets to provide three forward ratios and a reverse ratio. The common sun gear of the planetary gear sets is connected to the front clutch by a driving shell which is splined to the sun gear and to the front clutch retainer. The hydraulic system consists of a front and rear pump, and a single valve body which contains all of the valves except the governor valve.

Venting of the transmission is accomplished by a drilled passage through the upper part of the front oil pump housing.

The torque converter is attached to the crankshaft

CLUTCH ENGAGEMENT AND BAND APPLICATION CHART

BUTTON POSITION AND DRIVE CONDITION	FRONT CLUTCH	REAR CLUTCH	FRONT (KICKDOWN) BAND	REAR (LOW-REV.) BAND	OVERRUNNING CLUTCH
N NEUTRAL	DISENGAGED	DISENGAGED	RELEASED	RELEASED	NO MOVEMENT
D—DRIVE (DIRECT) 1.00 to 1	ENGAGED	ENGAGED	RELEASED	RELEASED	OVER RUNS
D—DRIVE (BREAKAWAY) 2.45 to 1	DISENGAGED	ENGAGED	RELEASED	RELEASED	HOLDS
D—DRIVE KICKDOWN (TO SECOND) 1.45 to 1	DISENGAGED	ENGAGED	APPLIED	RELEASED	OVER RUNS
2—SECOND 1.45 to 1	DISENGAGED	ENGAGED	APPLIED	RELEASED	OVER RUNS
2—SECOND KICKDOWN (TO LOW) 2.45 to 1	DISENGAGED	ENGAGED	RELEASED	RELEASED	HOLDS
1—LOW 2.45 to 1	DISENGAGED	ENGAGED	RELEASED	APPLIED	PARTIAL HOLD
1—LOW (RETARDING) 2.45 to 1	DISENGAGED	ENGAGED	RELEASED	APPLIED	NO MOVEMENT
R—REVERSE 2.20 to 1	ENGAGED	DISENGAGED	RELEASED	APPLIED	NO MOVEMENT

through a flexible driving plate. Cooling of the converter is accomplished by circulating the transmission fluid through an oil-to-water type cooler, located in the radiator lower tank. The torque converter assembly is a sealed unit which cannot be disassembled.

The transmission fluid is filtered by an internal "Dacron Type" filter attached to the lower side of the valve body assembly.

Engine torque is transmitted to the torque converter then, through the input shaft to the multiple disc clutches in the transmission. The power flow depends on the application of the clutches and bands. Refer to "Clutch Engagement and Band Application Chart".

1. HYDRAULIC CONTROL SYSTEM

Figures 3 through 10 show the position of the various valves with color coded passages to indicate those under hydraulic pressure for all operations of the transmission.

The hydraulic control system makes the transmission fully automatic, and has four important functions to perform. In a general way, the components of any automatic control system may be grouped into the following basic groups:

The pressure supply system, the clutches and band servos, the pressure regulating valves and the flow control valves.

Taking each of these basic groups or systems in turn, the control system may be described as follows:

Pressure Supply System

The pressure supply system consists of a front pump driven by the engine through the torque converter, and a rear pump driven by the transmission output shaft.

Pressure Regulating Valves

The pressure regulating valves consist of a regulator valve which controls line pressure at a value dependent on throttle opening.

The torque converter control valve maintains torque converter operating pressure and transmission lubricating pressure.

The governor valve transmits regulated pressure to the transmission (in conjunction with throttle pressure) to control upshift and downshift speeds.

The throttle valve transmits regulated pressure to the transmission (in conjunction with governor pressure) to control upshift and downshift speeds.

Flow Control Valves

The rear pump check valve prevents loss of front pump pressure through the rear pump circuit during reverse operation. The front pump check valve prevents loss of rear pump pressure through the front pump circuit when the front pump flow is recirculating.

A check valve is incorporated in the rear oil pump cover to prevent air from entering the system during reverse operation.

The manual valve obtains the different transmission drive ranges as selected by the vehicle operator.

The reverse blocker valve mechanically blocks the manual valve from moving into reverse position above approximately 20 mph.

The 1-2 shift valve automatically shifts the transmission from low to second or from second to low depending on the vehicle operation.

The 2-3 shift valve automatically shifts the transmission from second to direct or from direct to second depending on the vehicle operation.

The kickdown valve makes possible a forced downshift from direct to second-second to breakaway or direct to breakaway (depending on vehicle speed) by depressing the accelerator pedal past the detent "feel" near wide open throttle.

The shuttle valve has two separate functions and performs each independently of each other. The first is that of providing fast release of the kickdown band, and smooth front clutch engagement when the driver makes a "lift-foot" upshift from second to direct. The second function of the shuttle valve is to regulate the application of the kickdown servo and band when making direct to second kickdowns.

Clutches, Band Servos and Accumulator

The front and rear clutch pistons, and both servo pistons are moved hydraulically to engage the clutches and apply the bands. The pistons are released by spring tension when hydraulic pressure is released. On the 2-3 upshift, the kickdown servo piston is released by spring tension and hydraulic pressure.

The accumulator controls the hydraulic pressure on the apply side of the kickdown servo during the 1-2 shift; thereby, cushioning the kickdown band application at any throttle position.

2. GEARSHIFT AND PARKING LOCK CONTROLS

The push button gearshift control unit is essentially the same on all vehicles. The parking lock lever is attached to the left side of the push button unit. When the parking lock is applied, the transmission is automatically shifted to the neutral position by the control unit.

Some vehicles are equipped with a "lever type" console gearshift control. The transmission and park-

ing lock control cables are the same type as used with the push button control. The parking lock is applied by moving the selector lever past a gate to the PARK position.

CAUTION: Never apply the parking lock until the vehicle has stopped; otherwise, a severe ratcheting noise will occur.

3. OPERATING INSTRUCTIONS

The transmission will automatically upshift and downshift at approximately the speeds shown, in the "Shift Pattern Summary Chart". (See page 41)

NOTE: All shift speeds given in the "Shift Pattern Summary Chart" may vary somewhat due to production tolerances and rear axle ratios. This is not too important; however, the quality of the shifts is very important. All shifts should be smooth, responsive, and with no noticeable engine runaway.

Mountain Driving

When driving in the mountains with either heavy loads or when pulling trailers, the 2 (second) or 1 (low) position should be selected on upgrades which requires heavy throttle for ½ mile or more. Lower ratios reduces possibility of overheating the transmission and converter under these conditions. 1 (low) position is for severe operation or to obtain better control.

Push Starting

If the engine fails to start in the normal manner, it may be started by pushing. **Towing the vehicle to start is not recommended due to the sudden surge of power when the engine starts.**

Turn the ignition on, then push the 1 (low) button in, or move the selector lever to the low position and depress the accelerator pedal slightly. After the vehicle has been pushed to a speed of 15 to 25 mph (approximately), the transmission will drive the engine.

Towing Vehicle

Transmission Inoperative: Tow the vehicle with a rear end pickup or remove the propeller shaft.

Transmission Operating Properly: The vehicle may be towed safely in N (neutral) at moderate speeds. For long distance towing (over 100 miles), the propeller shaft should be removed.

2B - SERVICE - MAINTENANCE, ADJUSTMENTS AND TESTS

While in the process of making adjustments and tests, do not stall test the torque converter. For safety reasons and because damage to the transmission may occur, wide open throttle stall operation should be avoided.

SERVICE PROCEDURES

4. LUBRICATION

The transmission fluid and the oil filter should provide satisfactory lubrication and protection to the automatic transmission and no change is recommended in vehicles used in normal service. Regularly scheduled oil and filter changes, therefore will not be required in these vehicles, except when the operation of the vehicle is classified as severe.

If the regular operation of the vehicle is classified as severe, the transmission should be adjusted and the fluid and the oil filter changed approximately every 32,000 miles, according to any of the following:

Police or taxicab operation

Frequent towing of trailers

Continuous operation at higher than normal loading and/or temperature.

The transmission should not be idled in gear for long periods.

Fluid Level

Inspect the fluid level every 6 months (more often if conditions warrant) with the engine and transmission at normal operating temperature. Refer to "Lubrication and Maintenance", Group 0.

Drain and Refill

(1) Raise the vehicle on a hoist. Place a drain container with a large opening, under the transmission oil pan.

(2) Loosen the pan bolts at one corner, tap the pan to break it loose allowing the fluid to drain, then remove the oil pan.

(3) Remove the access plate from in front of the converter, remove the drain plug allowing the fluid to drain (Fig. 11). Install and tighten the converter drain plug to 14 inch-pounds torque, and install the access plate.

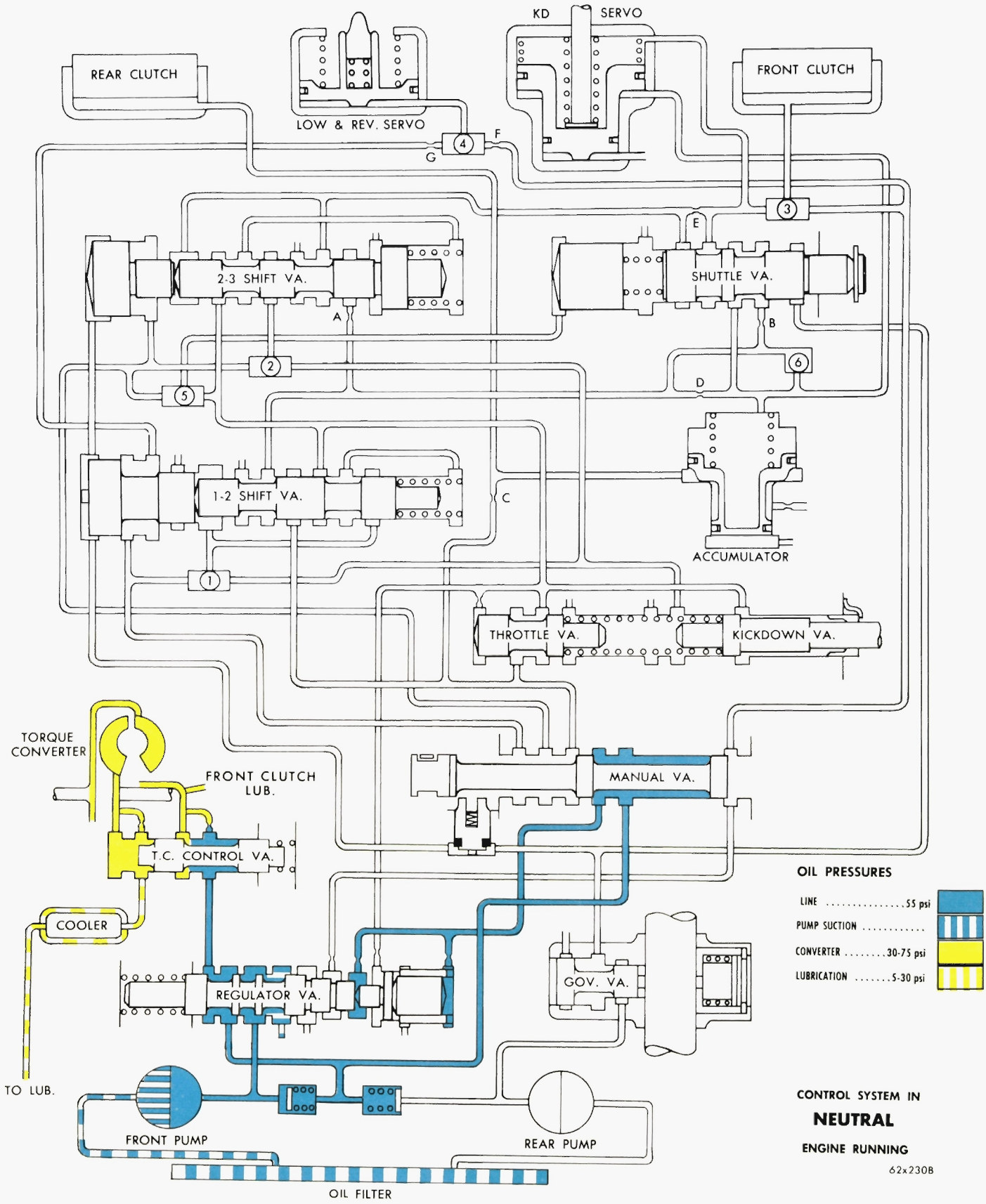


Fig. 3—Neutral Hydraulic Circuits

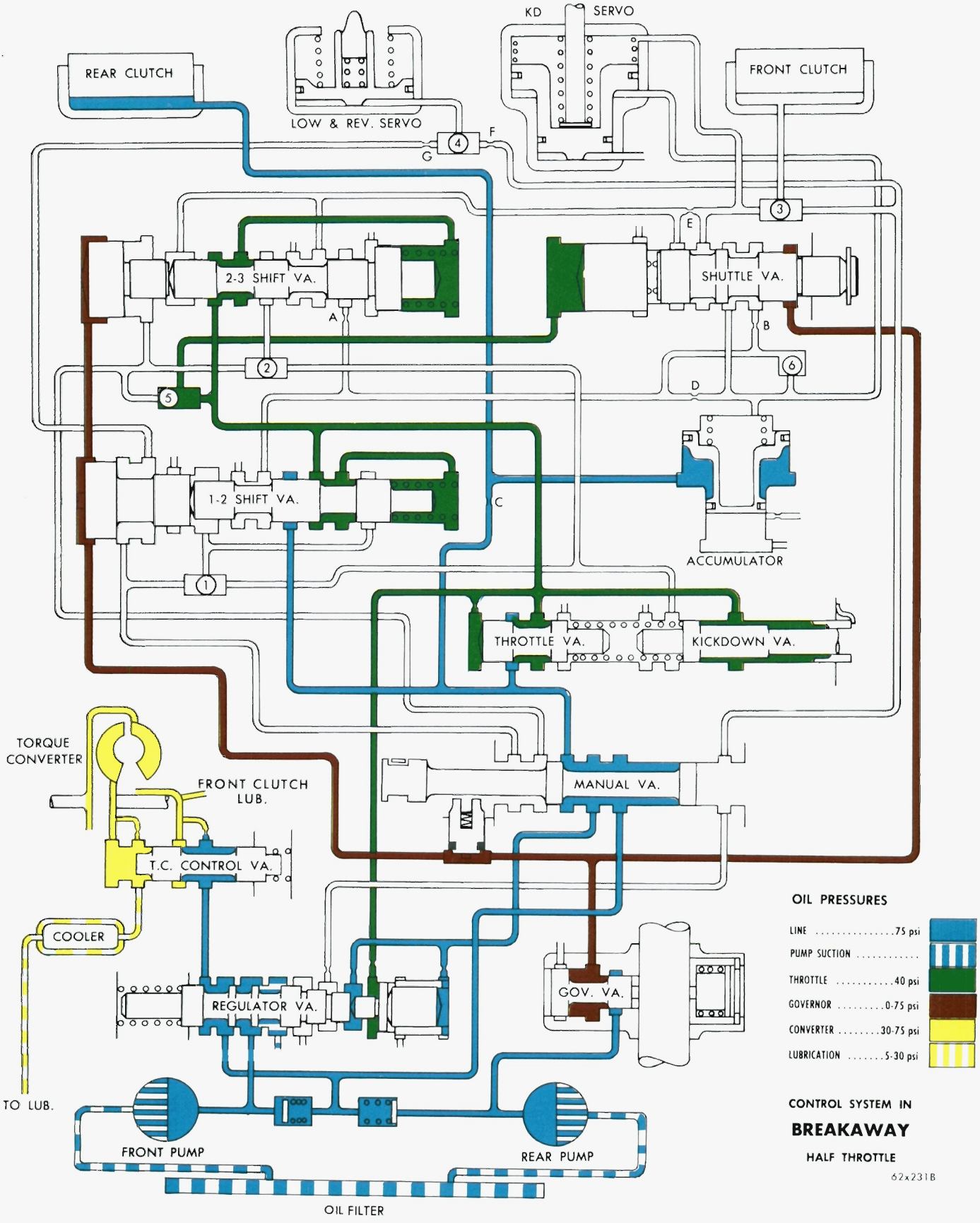


Fig. 4—Drive-Breakaway Hydraulic Circuits

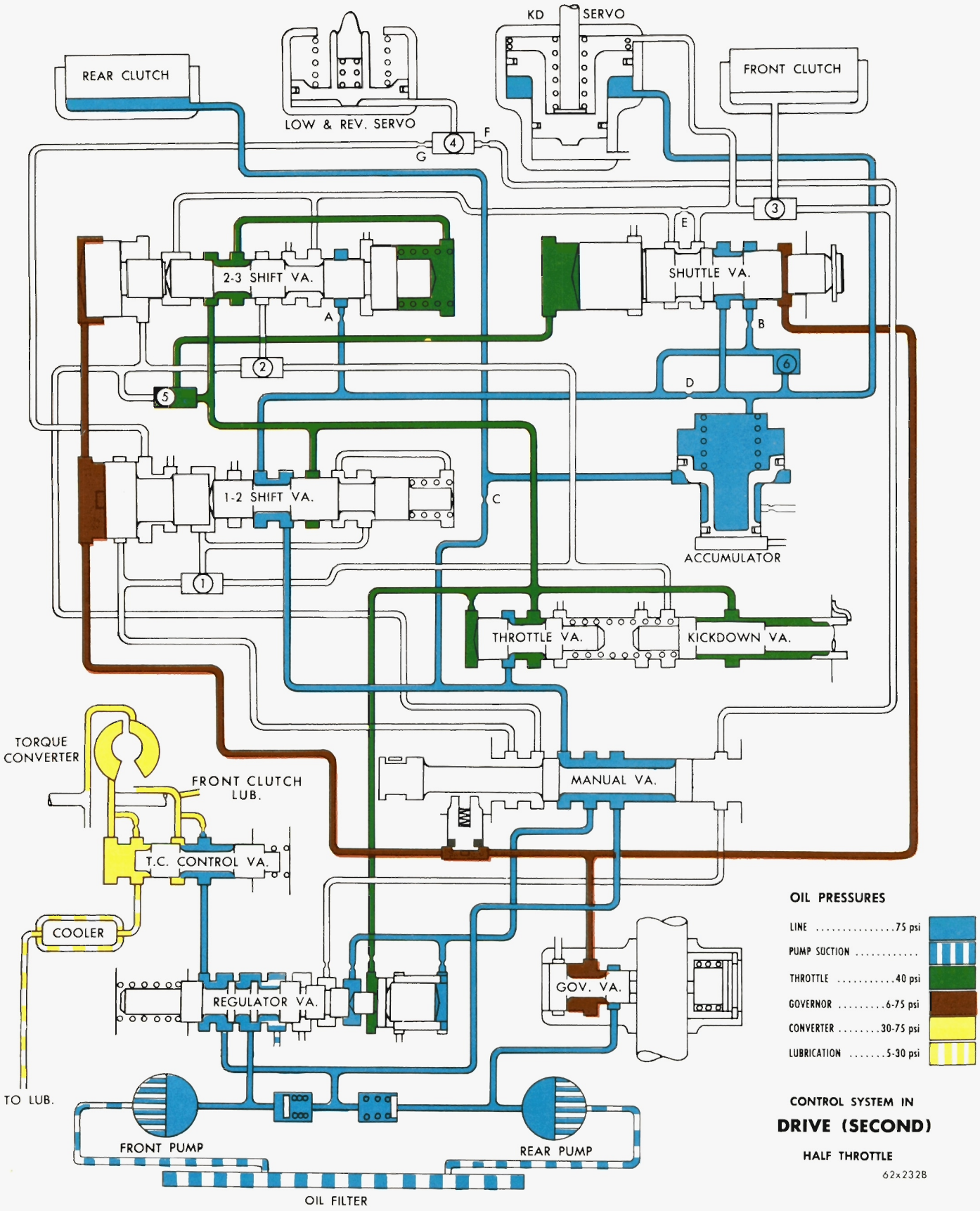


Fig. 5—Drive-Second Hydraulic Circuits

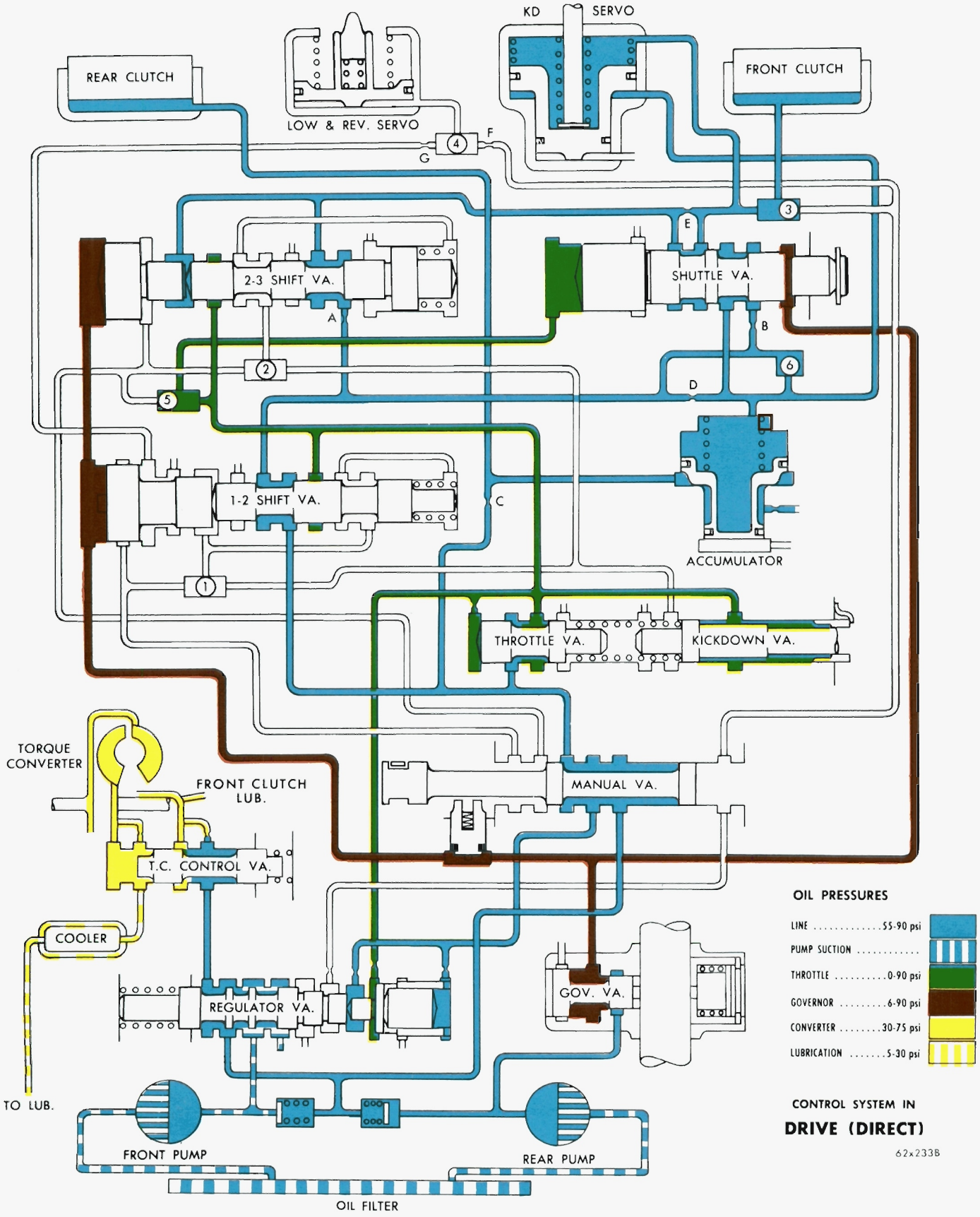


Fig. 6—Drive-Direct Hydraulic Circuits

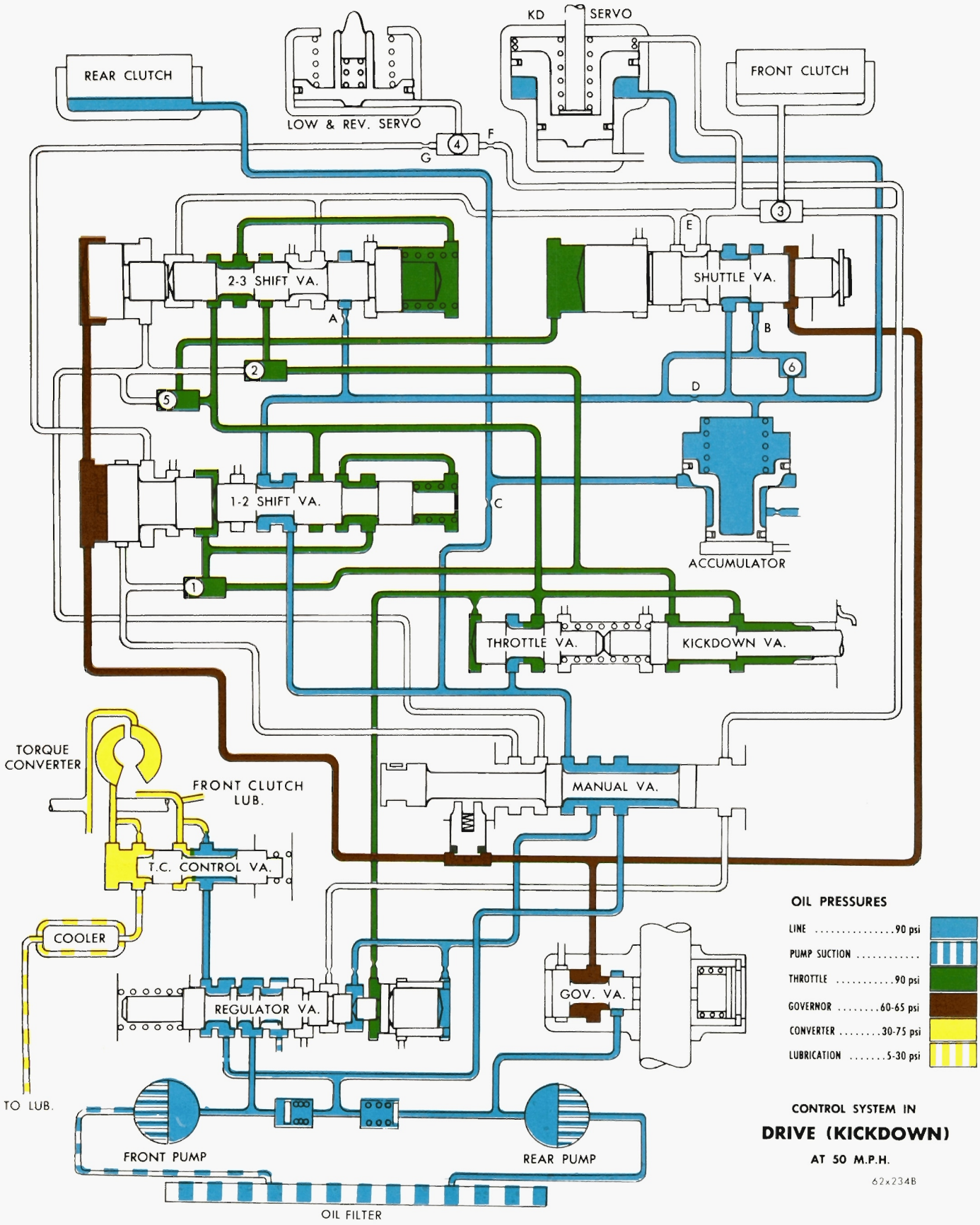


Fig. 7—Drive-Kickdown Hydraulic Circuits

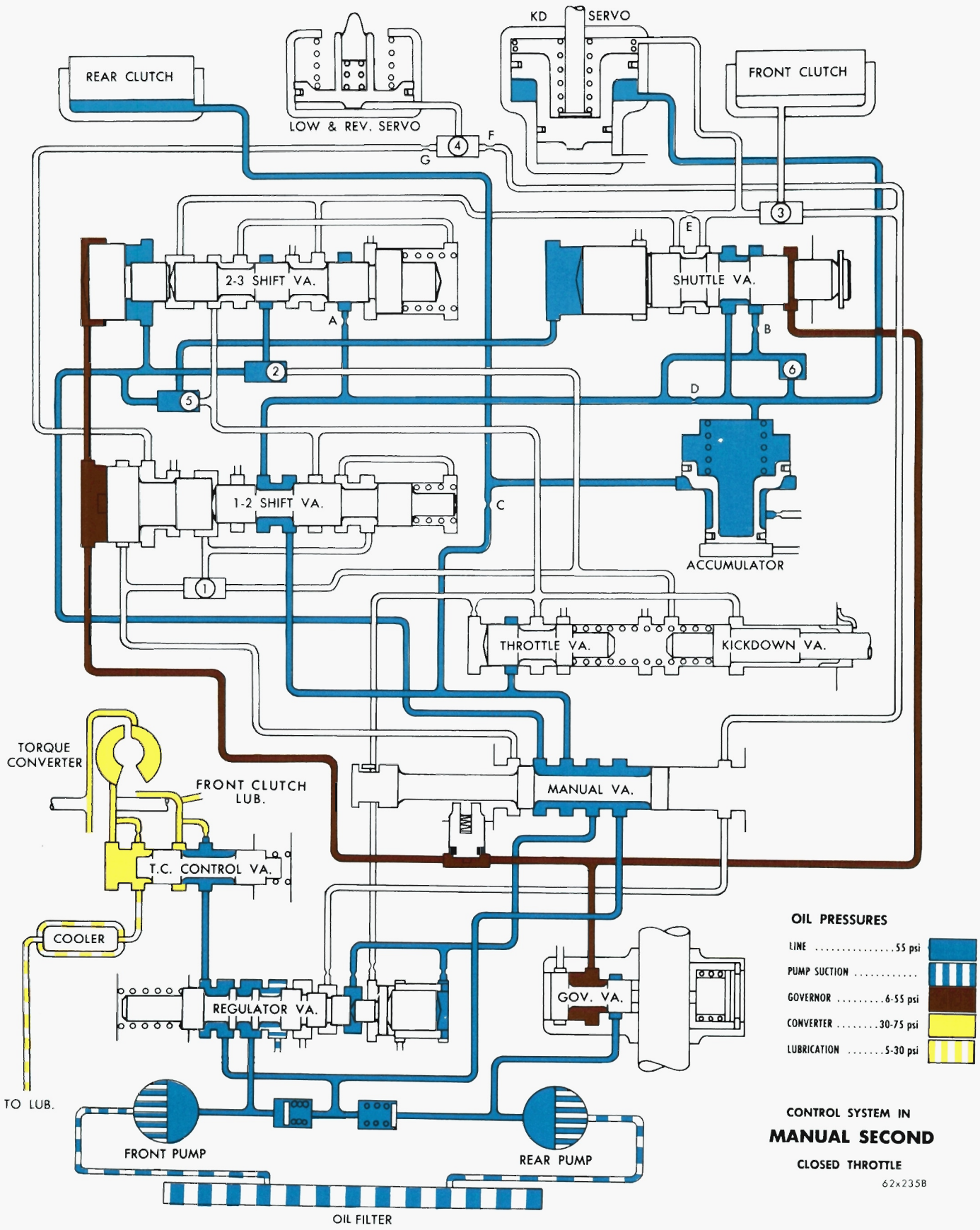


Fig. 8—Manual Second Hydraulic Circuits

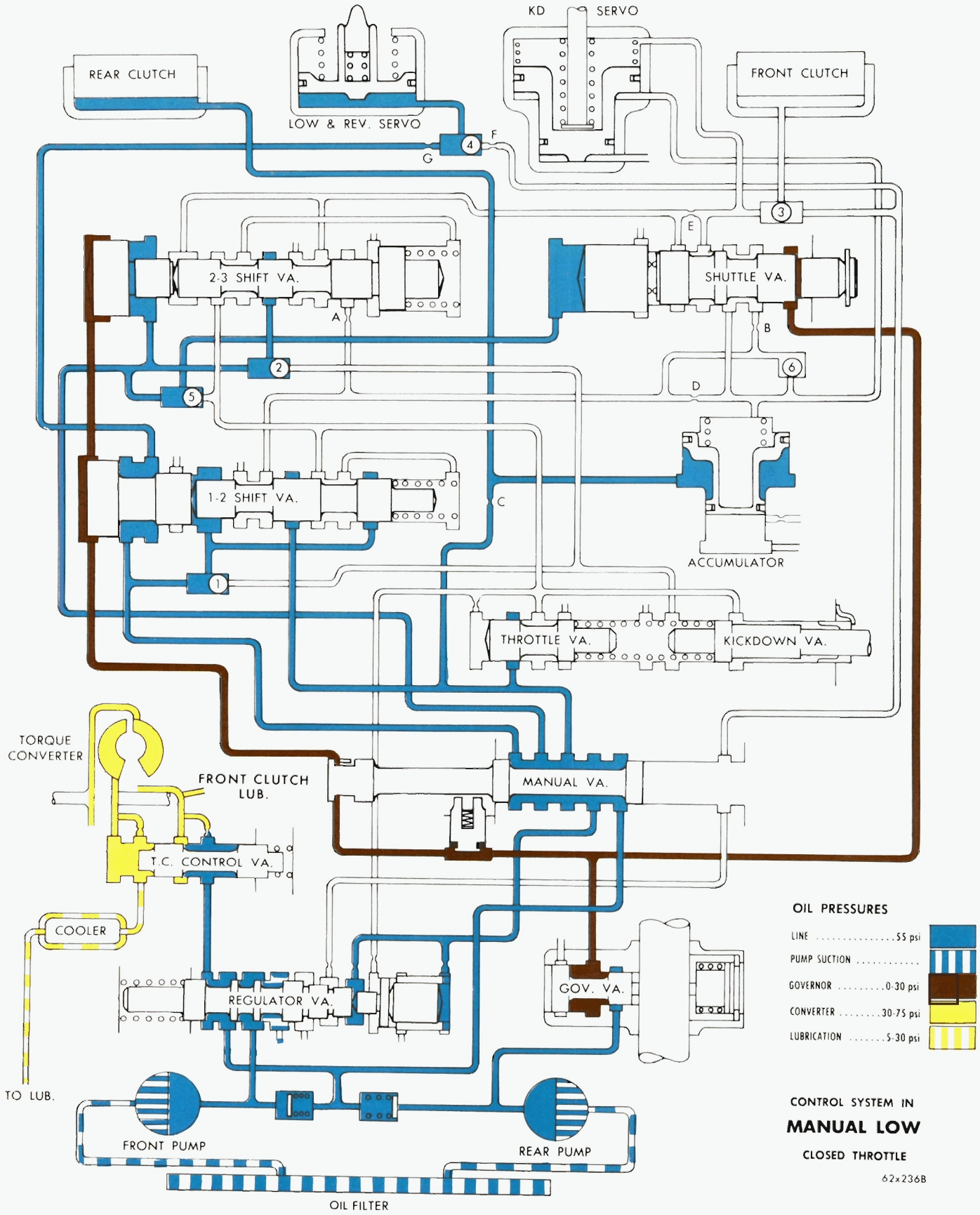


Fig. 9—Manual Low Hydraulic Circuits

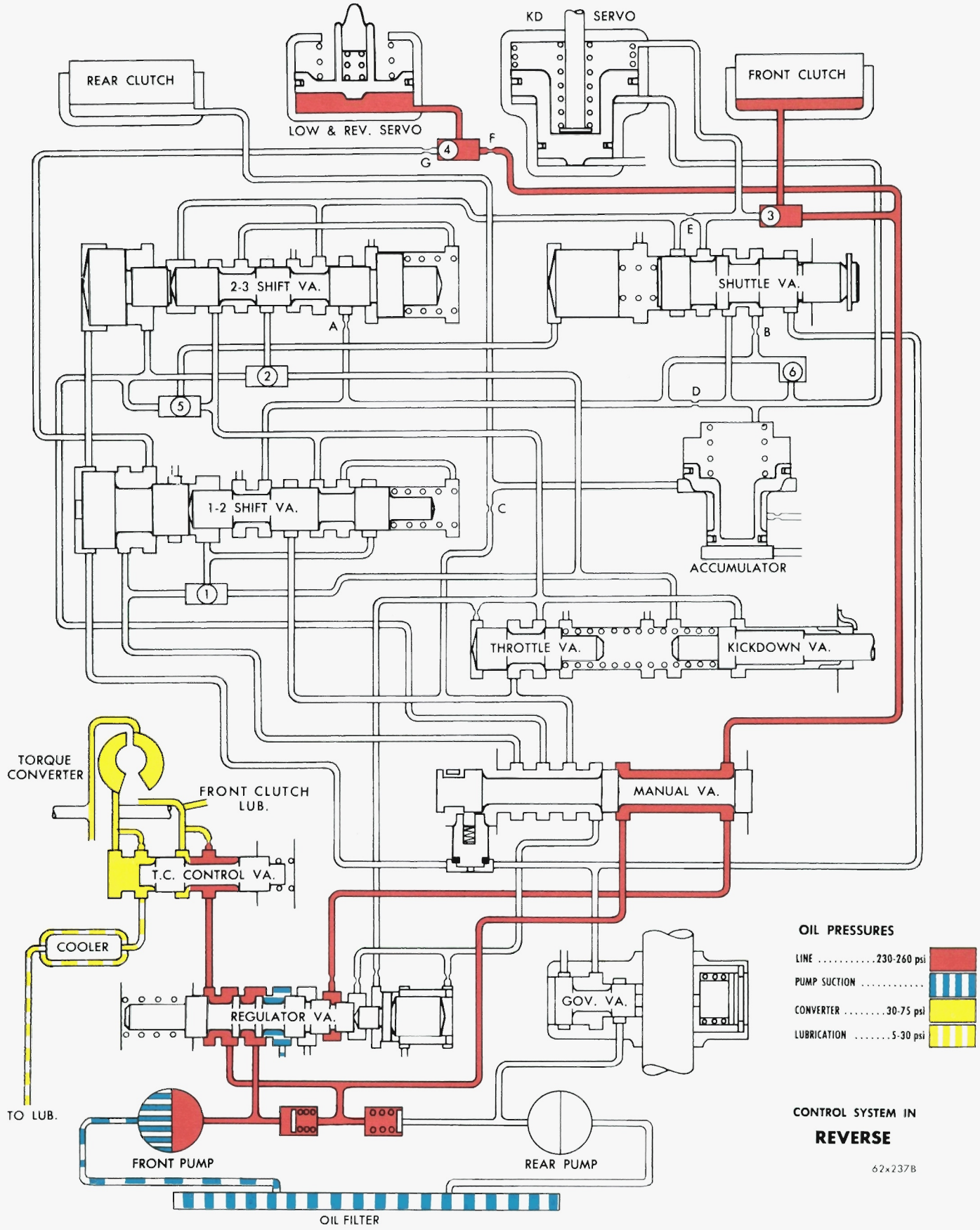


Fig. 10—Reverse Hydraulic Circuits

SHIFT PATTERN SUMMARY CHART
TORQUEFLITE TRANSMISSION
(Valiant with 650-13 Tires)

Condition	CAR SPEED—170 CU. IN. ENG. (Axle Ratio) 3.23-1	3.55-1	CAR SPEED—225 CU. IN. ENG. (Axle Ratio) 2.93-1	3.23-1	3.55-1
Closed Throttle 1-2 Upshift	6-11	6-10	7-13	6-12	6-10
Closed Throttle 2-3 Upshift	10-14	9-13	11-16	10-14	9-13
Wide Open Throttle 1-2 Upshift	25-41	23-36	28-40	25-36	23-33
Wide Open Throttle 2-3 Upshift	58-69	52-63	59-72	53-65	49-59
3-2 Kickdown Limit	46-62	42-56	46-63	42-57	38-53
3-1 Kickdown Limit	24-35	22-32	27-33	24-30	22-28
Closed Throttle Downshift	4-10	4-9	5-12	4-10	4-10

SHIFT PATTERN SUMMARY CHART
TORQUEFLITE TRANSMISSION
(Plymouth 6 with 700-14 Tires)

Condition	CAR SPEED—225 CU. IN. ENG. (Axle Ratio) 2.93-1	3.23-1	3.31-1	3.55-1
Closed Throttle 1-2 Upshift	7-14	6-13	6-12	6-12
Closed Throttle 2-3 Upshift	11-17	10-15	10-15	9-14
Wide Open Throttle 1-2 Upshift	29-42	26-38	26-37	24-35
Wide Open Throttle 2-3 Upshift	62-76	56-69	55-67	51-63
3-2 Kickdown Limit	48-67	43-62	42-59	40-55
3-1 Kickdown Limit	28-35	25-32	25-31	23-29
Closed Throttle Downshift	5-13	5-12	4-12	4-11

SHIFT PATTERN SUMMARY CHART
TORQUEFLITE TRANSMISSION
(Plymouth 8 with 700-14 Tires)

Condition	CAR SPEED TO AXLE RATIOS 318 Cu. In. Eng. 8 Cylinder Std. 2.76-1	3.23-1	361, 383 Cu. In. Eng. 8 Cylinder (Hi Per.) 2.93-1	3.23-1	426 Cu. In. Eng. 3.23-1	3.91-1
Closed Throttle 1-2 Upshift	8-14	7-12	6-13	6-12	6-12	5-10
Closed Throttle 2-3 Upshift	13-18	11-15	12-18	11-16	11-17	9-14
Wide Open Throttle 1-2 Upshift	32-45	27-38	30-43	27-39	44-59	37-49
Wide Open Throttle 2-3 Upshift	69-80	58-69	65-76	59-69	82-93	68-77
3-2 Kickdown Limit	60-74	51-63	56-70	51-63	73-87	61-72
3-1 Kickdown Limit	30-38	25-33	27-35	25-32	28-53	23-44
Closed Throttle Downshift	5-13	4-11	4-12	4-11	4-11	3-9

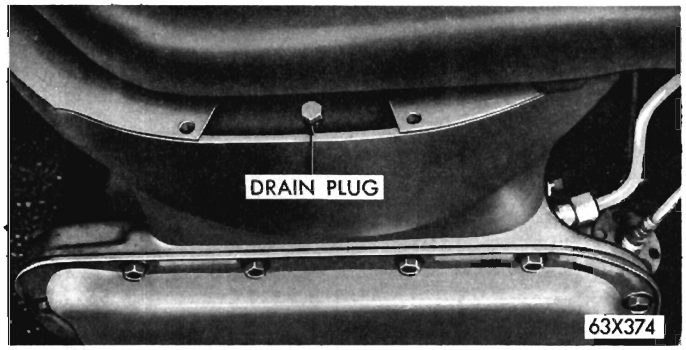


Fig. 11—Converter Drain Plug

(4) If necessary, adjust the reverse band (Refer to Paragraph 12).

(5) Install a new oil filter on the bottom of the valve body. Be sure to use a new gasket and tighten the retaining screws to 28 inch-pounds torque.

(6) Clean the oil pan, and reinstall using a new gasket. Tighten the oil pan bolts to 150 inch-pounds torque.

(7) **Six Cylinder Cars:** Pour five quarts of Automatic Transmission Fluid Type "A" Suffix "A" through the filler tube.

Eight Cylinder Cars: Pour eight quarts of Automatic Transmission Fluid Type "A" Suffix "A" through the filler tube.



Fig. 12—Dip Stick Markings

(8) Start the engine and allow to idle for at least two minutes. Then, with the parking brake on, depress each button momentarily, ending with the N (neutral) button pushed in or move the selector lever to each position, ending in the neutral position.

(9) Add sufficient fluid to bring the fluid level to the **"ADD ONE PINT"** mark.

Recheck the fluid level after the transmission is at normal operating temperature. The level should be between the **"FULL"** mark and the **"ADD ONE PINT"** mark (Fig. 12).

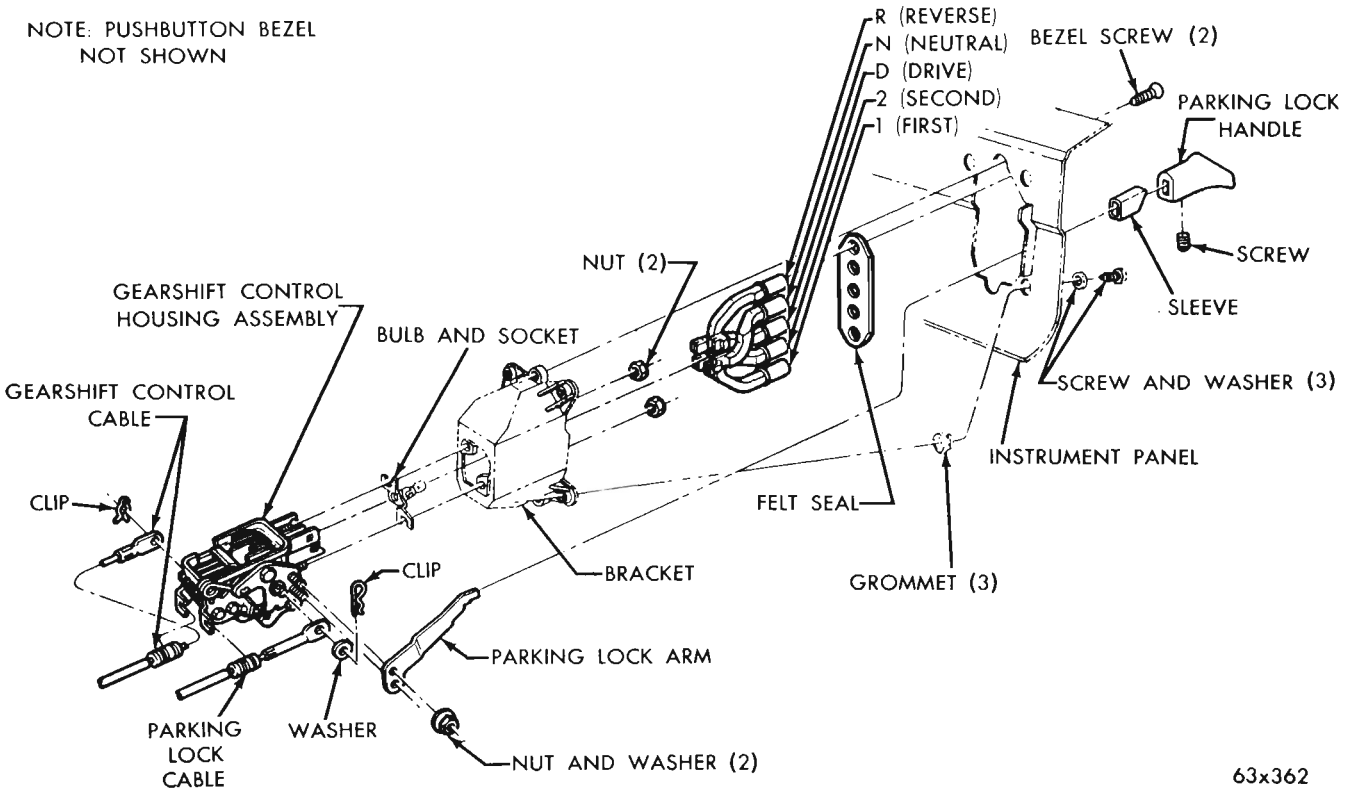


Fig. 13—Removing or Installing Gearshift Control Unit (Valiant)

CAUTION: To prevent dirt from entering the transmission, make certain that the dip stick cap is fully seated onto the filler tube.

Periodic Adjustments

The following adjustments should be performed at 32,000 mile intervals or more frequent under abnormal operating conditions.

(1) Adjust the kickdown band. Refer to Paragraph 12.

(2) Adjust the gearshift control cable (Refer to Paragraph 9).

(3) Adjust the engine idle in neutral. Refer to the "Fuel System", Group 14.

(4) Adjust the transmission and carburetor throttle linkage to obtain the proper shift pattern (Refer to Paragraph 13).

5. PUSH BUTTON CONTROL UNIT

Removal

(1) Disconnect the negative (ground) cable from the battery.

(2) Disconnect the back-up lamp switch wire connectors (if so equipped).

(3) Remove the parking lock handle from the arm (Fig. 13 or 14).

(4) **Valiant Models:** Remove the windshield wiper, headlamp switch knobs, switch bezels, then remove the switches. Remove two screws from the push button bezel, then remove the bezel and seal.

NOTE: Models with the narrow push button bezel do not require removal of the switches.

Plymouth Models: Remove three screws from the push button bezel, then remove the bezel and seal.

(5) Remove all push buttons (except neutral button) by pulling them off the control actuator slides.

(6) Using a socket and long extension through the push button opening, remove two nuts securing the control assembly to the mounting bracket (Fig. 13 or 14). Carefully work the assembly rearward out of the cluster.

(7) Remove the neutral push button, and disconnect the push button gearshift and parking lock cables from the control unit.

Control Unit Adjustment

The following procedures describe the gearshift control unit adjustments. If the transmission fails to shift into **NEUTRAL** when the parking lock is applied, inspect the parking lock lever travel in the instrument panel slot and the parking lock cable adjustment at the transmission before adjusting the control unit (Refer to Paragraph 10).

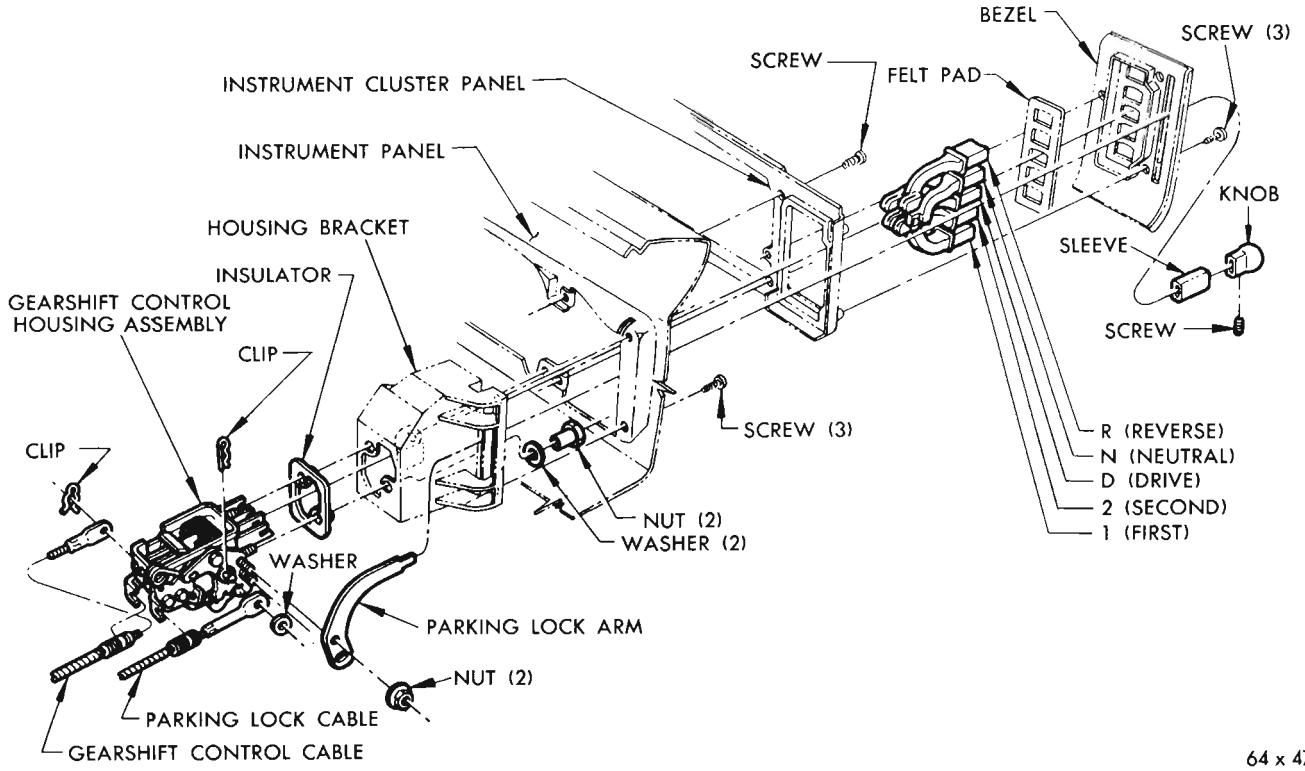


Fig. 14—Removing or Installing Gearshift Control Unit (Plymouth)

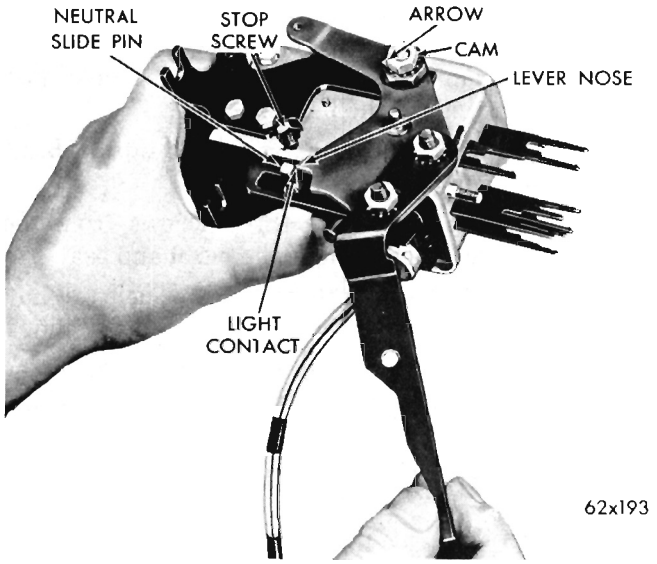


Fig. 15—Adjusting Lever Nose Contact at Neutral Slide Pin

(1) Remove the overcenter spring and back off the lever stop screw (Fig. 15). Make sure no binding exists in the neutral slide, neutral slide pin and bushing, cam pivot, and that they are adequately lubricated.

(2) Hold the neutral slide in against the rocker bar with about a 5 to 10 pound load.

(3) Loosen the lock nut and rotate the cam so the lever nose just touches the neutral slide pin as it passes over the pin when moving the parking lock lever from the **OFF** to **ON** position. Only light contact should occur so the lever does not hang up on the pin. Hold the cam in this position and tighten the lock nut to 95 inch-pounds torque. Install the overcenter spring.

(4) Adjust the lever stop screw to obtain .010 inch clearance between the neutral slide pin and the lever heel (Fig. 16). Tighten the lever stop screw lock nut securely.

Installation

(1) Connect the push button gearshift and parking lock cables to the control unit. Secure the cable housings by clamping them in the control brackets.

(2) Install the neutral push button on the neutral actuator slide. Carefully guide the control unit into position from the rear of the instrument cluster. Install the two retaining nuts and tighten securely.

(3) Install the other push buttons in proper order on the control actuator slides.

(4) **Valiant Models:** Install the push button seal and bezel. Install and tighten the bezel retaining screws. Install the windshield wiper and headlamp switches if removed.

Plymouth Models: Install the push button seal and bezel. Install and tighten the bezel retaining screws.

(5) Operate the push buttons and correct any binding that might exist.

(6) Install the parking lock control handle. Connect the back-up switch wires (if so equipped).

(7) Connect the battery ground cable.

6. CONSOLE GEARSHIFT UNIT (Fig 17)

Removal

(1) Remove the gearshift and parking lock cables

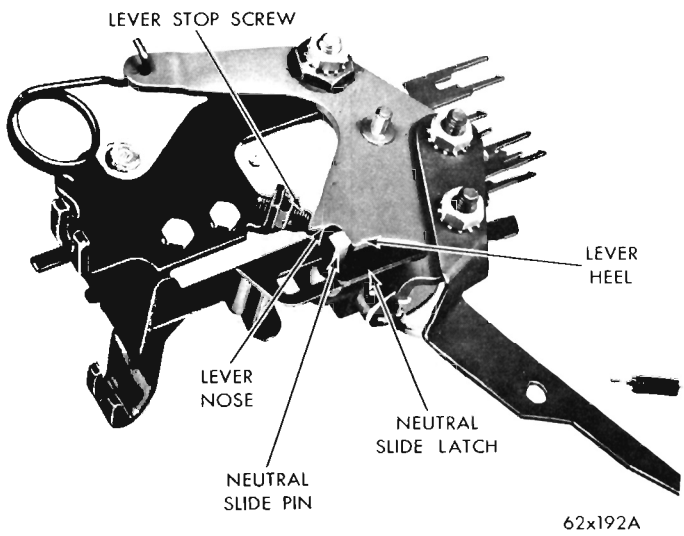


Fig. 16—Adjusting Lever Heel to Neutral Slide Pin Clearance

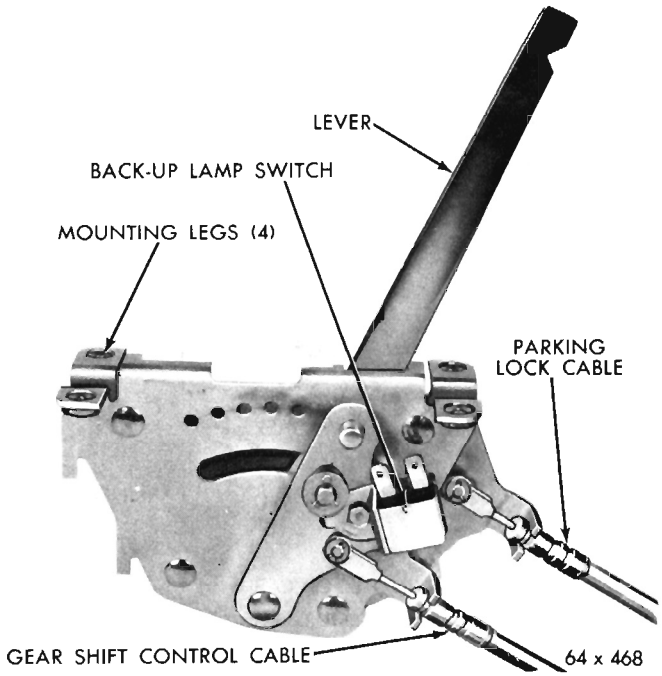


Fig. 17—Console Gearshift Unit

from the transmission. Refer to Paragraphs 9 and 10. Remove the adjusting wheel from the gearshift cable.

(2) Remove the set screw from the gearshift lever knob and remove the knob.

(3) Remove the two screws from the top rear end of the console upper finish plate. Raise the rear end of the finish plate and work it rearward to disengage it from the front of the console. Lift the finish plate upward far enough to remove the dial lamp and socket, then lift off the plate.

(4) Remove the four inner bolts securing the gearshift unit to the console.

(5) Carefully raise the lower edge of the console side trim to obtain access to the console-to-floor bracket mounting bolts (three bolts on each side of the console). Loosen the bolts several turns, but do not remove.

(6) Disconnect the courtesy lamp wires, then lift off the console assembly.

(7) Carefully pull the gearshift and parking lock cables through the grommets in the floor pan and remove the gearshift control unit assembly.

Installation

(1) Insert the gearshift and parking lock cables through the openings in the floor pan. Place the gearshift control unit on the temporary floor pan support to hold it in place while installing the console.

(2) Lower the console down over the shift lever and connect the courtesy lamp wires, then position the console on the floor mounting brackets. Making sure the retaining bolt flat washers are outside of the console flange, tighten the six bolts securely.

(3) Lift the gearshift control unit off the temporary support. Align the control unit in the console, install and tighten the four retaining bolts.

(4) Slide the three tabs on the front end of the console finish plate under the finish moulding at the front, and lower the finish plate far enough to install the dial lamp and socket. Then lower the rear of the finish plate into position and install the two retaining screws.

(5) Install the gearshift lever knob and secure with the set screw.

(6) Inspect the cables for proper routing. Make sure there are no sharp kinks or interference with other parts.

(7) Install the adjusting wheel on the gearshift cable. Install the cables in the transmission and adjust as outlined in Paragraphs 9 and 10.

7. BACK-UP LAMP SWITCH REPLACEMENT (If So Equipped)

(1) **Push Button Type:** Remove the push button gearshift and parking lock control unit. Straighten the four tabs that hold the switch to the switch bracket, and separate the switch from the bracket.

To install, place the switch in position on the switch bracket and bend over the four tabs. Reinstall the push button gearshift and parking lock control unit.

(2) **Console Lever Type:** Refer to Paragraph 6 and perform steps 2 through 6 under "Removal"

Disconnect the switch wires and remove the screw attaching the switch to the side of the gearshift unit.

To install, attach the switch to the side of the gearshift unit and tighten the retaining screw. Connect the wires and test the back-up light for proper operation. Refer to Paragraph 6 and perform steps 2 through 5 under "installation".

8. PUSH BUTTON AND CONSOLE SHIFT LAMP REPLACEMENT

The Valiant push button lamp is located approximately in the center of the push button cluster. To replace the bulb, remove the push button bezel and necessary push buttons. Slide a short place of tight fitting rubber hose over the bulb to remove it from the socket.

The Plymouth push button lamp is located on the back side of the instrument cluster, next to the inner side of the push button control unit mounting bracket. The bulb can be replaced by removing the bulb socket from the rear of the instrument cluster.

The console selector lever dial lamp is located directly under the dial. To replace the bulb, remove the console upper the finish plate and remove the socket and bulb. Refer to Paragraph 6. Steps 2 and 3 under "Removal".

9. GEARSHIFT CONTROL CABLE (Transmission End)

Removal

(1) Raise the vehicle on a hoist.

(2) Remove the gearshift control cable to transmission adjusting wheel lock screw. Pull the cable outward just enough to allow the fluid to drain into a container.

(3) Pull the cable out of the transmission case as far as possible, back off the adjusting wheel a few turns if necessary.

(4) Insert a small screw driver above and slightly to the right of the cable (Fig. 18). Disengage the

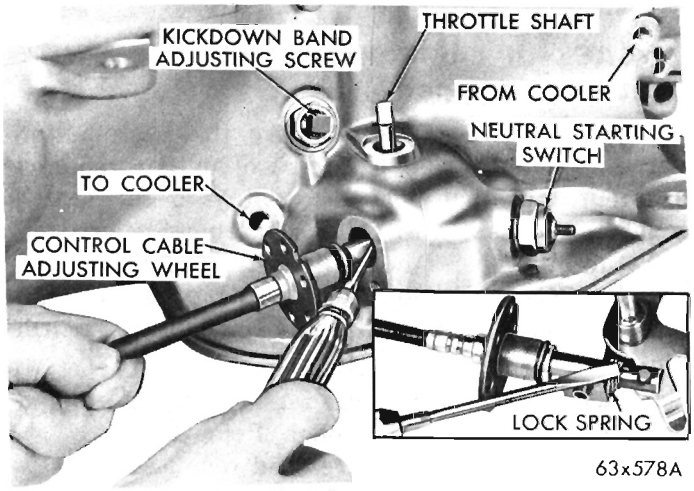


Fig. 18—Removing Gearshift Control Cable

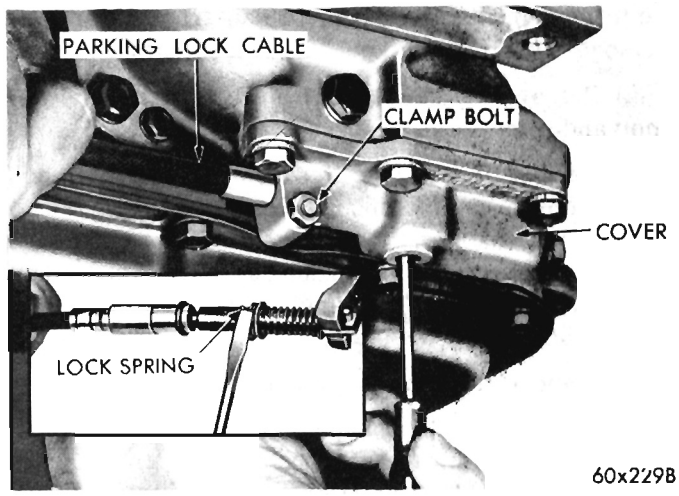


Fig. 19—Removing Parking Lock Cable

cable adapter lock spring by pushing the screw driver handle to the right while pulling outward on the cable.

Installation

(1) **Push Button Type:** With the parking lock lever in the **OFF** position, have an assistant engage the (R) button and hold it firmly engaged until the cable attachment operation is completed.

(2) **Console Lever Type:** Place the selector lever in the PARK position.

(3) Back the adjustment wheel off on the cable housing (counter-clockwise) until two or three threads are showing on the guide behind the wheel.

(4) Lubricate the cable housing with transmission fluid, insert the cable in the transmission case, push inward on the cable making sure the lock-spring engages the cable.

Adjustment

(5) **Push Button Type:** Have an assistant hold the (R) button firmly depressed. Hold the control cable guide centered in the hole of the transmission case and apply only enough inward force (approximately two pounds) to bottom the assembly in the reverse detent. While holding the cable bottomed, rotate the adjustment wheel **clockwise** until it just contacts the case squarely.

Turn the wheel **clockwise** just enough to make the next adjustment hole in the wheel line up with the screw hole in the case. Counting this hole as number one, continue turning the wheel **clockwise** until the fifth hole lines up with the screw hole in the case.

(6) **Console Lever Type:** Have an assistant hold the selector lever firmly in the 1 (low) position. Hold the control cable centered in the hole of the transmission case and pull the cable outward (approximately two pounds) to bottom the assembly in the low detent. While holding the cable outward, **rotate** the adjustment wheel **clockwise** until it just contacts the case squarely.

Turn the wheel **counter-clockwise** just enough to make the next adjustment hole in the wheel line up with the screw hole in the case. Counting this hole as number one, continue turning the wheel **counter-clockwise** until the fifth hole lines up with the screw hole in the case.

(7) Push the cable and adjusting wheel tight against the case then install the lock screw and tighten to 75 inch-pounds torque.

(8) Refill the transmission with Automatic Transmission Fluid Type "A" Suffix "A" to the proper level. Refer to Paragraph 4.

10. PARKING LOCK CABLE (Transmission End)

Removal

(1) Loosen the parking lock cable clamp bolt where the cable enters the housing cover (Fig. 19). Tap the end of the clamp bolt lightly to release its hold on the cable. Remove the housing cover lower plug.

(2) With a screw driver inserted through the plug opening, push gently against the projecting portion of the cable lock-spring, then withdraw the lock cable.

CAUTION: Do not use pliers or similar tool to withdraw the cable from the adapter cover as the cable cover might be damaged causing an oil leak.

Installation

(1) Place the push button parking lock lever in the OFF position, or place the console selector lever in the NEUTRAL position.

(2) Insert a screw driver through the plug opening and position it behind the cable adapter stop washer

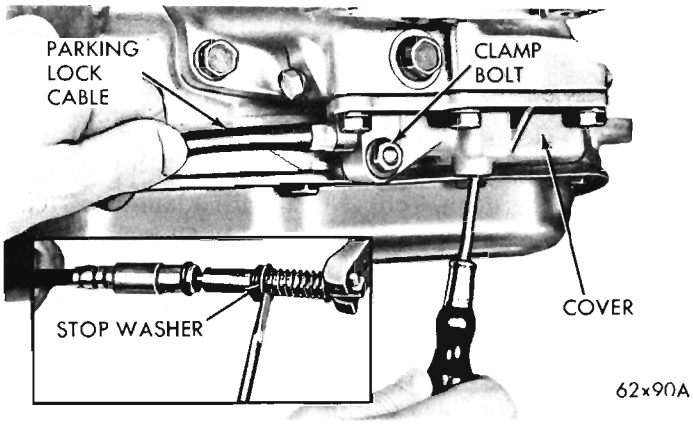


Fig. 20—Installing Parking Lock Cable

(Fig. 20). Hold the adapter outward while pushing the cable in as far as possible, making sure the lock-spring engages the cable.

(3) Gently pull outward on the cable housing to its limit of travel, release and then tighten the clamp bolt to 10 inch-pounds torque. Reinstall the plug in the cover and tighten to 75 inch-pounds torque.

Adjustment—Parking Lock Lever (Push Button Control Only)

(1) Operate the parking lock lever from one end of the slot in the instrument panel to the other. The lever should have clearance at both ends. One hole in the parking lock arm is slotted to permit the parking lock lever adjustment (Fig. 13 or 14). If adjustment of the lever is required, first loosen the cable clamp bolt on the transmission, making sure the cable housing is free to move in the parking sprag cover hole.

(2) To adjust, move the lever to the fully **OFF** position. Loosen the two nuts attaching the lock arm to the pushbutton housing. Loosen the nuts just enough to free up the lock arm.

(3) Block the locking level $\frac{1}{16}$ inch from the **OFF** end of the lever slot, then tighten the two nuts on the pushbutton housing. Recheck lever travel to be certain that clearance exists at both ends of the lever travel.

(4) Place the parking lock lever (on the instrument panel) in the **OFF** position.

Adjustment—Transmission Cable End (Push Button and Console Shift)

(5) If not performed in Step 1, loosen clamp bolt securing the cable housing in the parking sprag lever cover on the bottom of the transmission extension housing. Tap the end of clamp bolt lightly to release its hold on the cable.

(6) Gently pull outward on the cable housing to its limit of travel, release and then tighten the clamp bolt to 10 inch-pounds torque.

CAUTION: Do not use pliers or similar tool to pull outward on the cable as the cable cover might be damaged causing an oil leak.

(7) Test the adjustments by allowing the vehicle to roll slowly on a slight incline. The parking sprag should fully engage the gear with the lever in the **ON** position, and there should be no ratcheting noise with the lever in the **OFF** position.

11. NEUTRAL STARTING SWITCH

Adjustment and Test (Push Button Control Only)

(1) With the proper control cable adjustment assured, depress the N (neutral) push button.

(2) Raise the vehicle on a hoist, loosen the neutral starting switch allowing the fluid to drain into a container.

(3) Unscrew the neutral starting switch from the transmission case and inspect to see that the switch operating lever finger is aligned in the center of switch opening in the case.

(4) Place the cupped washer and "O" ring over the threads of the switch (Fig. 21), then screw the switch into the transmission case a few turns.

(5) Connect one lead of a test lamp to the battery current and the other lead to the switch terminal. Screw the switch into the transmission case until the lamp lights, then tighten the switch an additional ¼ to ⅜ turn.

NOTE: The switch must be tight enough to prevent oil leakage. If not, add a thin washer and readjust the switch. Do not tighten over 60 foot-pounds torque.

(6) Remove the test lamp and connect the wire to the switch.

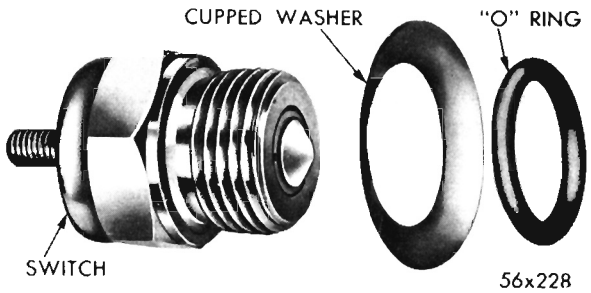


Fig. 21—Neutral Starting Switch

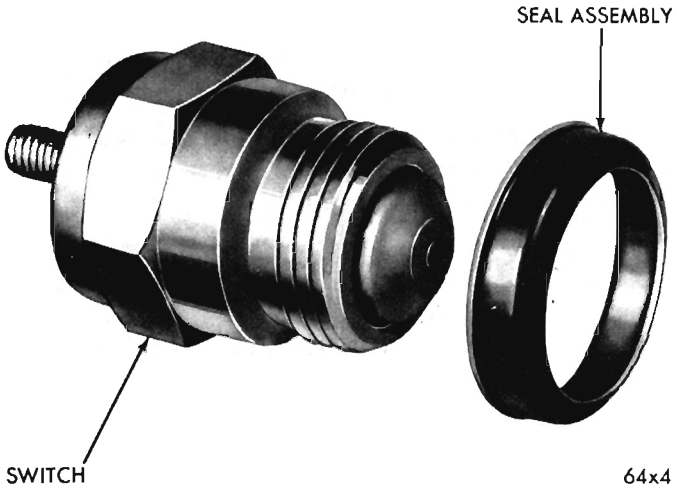


Fig. 22—Neutral Starting Switch

(7) Add fluid to the transmission to bring it up to proper level. Refer to Paragraph 4.

Adjustment and Test (Console Shift Only)

The neutral starting switch (Fig. 22) should operate in both the PARK and NEUTRAL selector lever positions.

(1) To test the switch, disconnect the wire from the switch.

(2) Connect one lead of a test lamp to battery current and the other lead to the switch terminal. If the test lamp does not light, the switch may be faulty, out of adjustment, or the gearshift control cable may be improperly adjusted.

(3) Unscrew the switch from the transmission case allowing the fluid to drain into a container. Move the selector lever to the PARK and then to the NEUTRAL positions, and inspect to see that the switch operating lever is centered in the switch opening in the case.

(4) Screw the switch into the transmission case and tighten to 25-35 foot-pounds torque. Retest the switch with the test lamp.

(5) Add fluid to the transmission to bring up to the proper level. Refer to Paragraph 4.

NOTE: Test the starter for operating in all push button or selector lever positions. If it should operate in any position other than push button neutral or selector lever park and neutral, readjust the gearshift control cable. Refer to Paragraph 9. In some cases, it may be necessary to align the valve body neutral and/or park fingers with the switch plunger. Refer to Paragraph 24.

12. BAND ADJUSTMENTS

Kickdown Band

The kickdown band adjusting screw is located on the left side of the transmission case near the throttle lever shaft (Fig. 18).

(1) Loosen the lock nut and back off approximately five turns. Test the adjusting screw for free turning in the tranmsission case.

(2) Using wrench, Tool C-3380 with adapter C-3705, tighten the band adjusting screw 47 to 50 inch-pounds torque. If adapter C-3705 is not used, tighten the adjusting screw to 72 inch-pounds which is the true torque.

(3) **Six Cylinder Cars:** Back off the adjusting screw 2 turns. (225 cu. in. engine) and 2⅝ turns (170 cu. in. engine). Hold the adjusting screw in this position and tighten the lock nut to 25 foot-pounds torque.

Eight Cylinder Cars: Back off the adjusting screw 2 turns. Hold the adjusting screw in this position and tighten the lock nut to 29 foot-pounds torque.

Low and Reverse Band

(1) Raise the vehicle, drain the transmission fluid and remove the oil pan.

(2) Loosen the adjusting screw lock nut and back off nut approximately five turns (Fig. 23). Test the adjusting screw for free turning in the lever.

(3) Using wrench, Tool C-3380 with adapter C-3705, tighten the band adjusting screw 47 to 50 inch-pounds torque. If adapter C-3705 is not used, tighten the adjusting screw to 72 inch-pounds which is the true torque.

(4) **Six Cylinder Cars:** Back off the adjusting screw 5¼ turns. Hold adjusting screw in this position and tighten the lock nut to 20 foot-pounds torque.

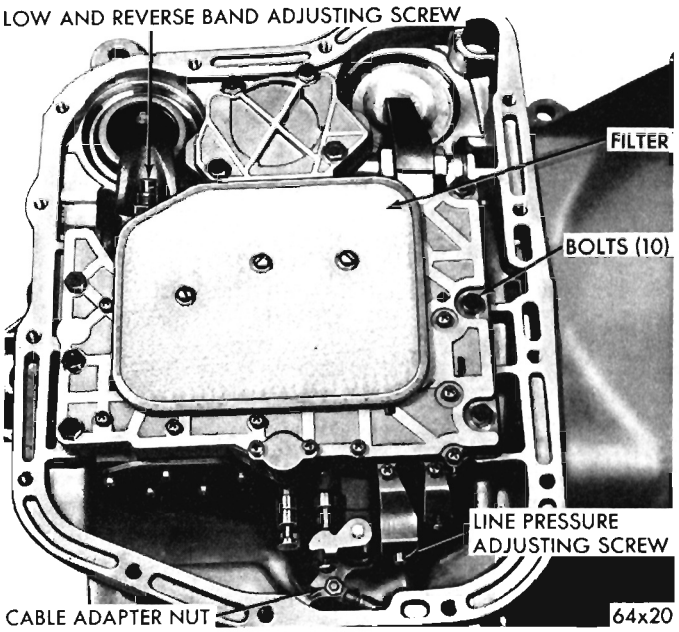
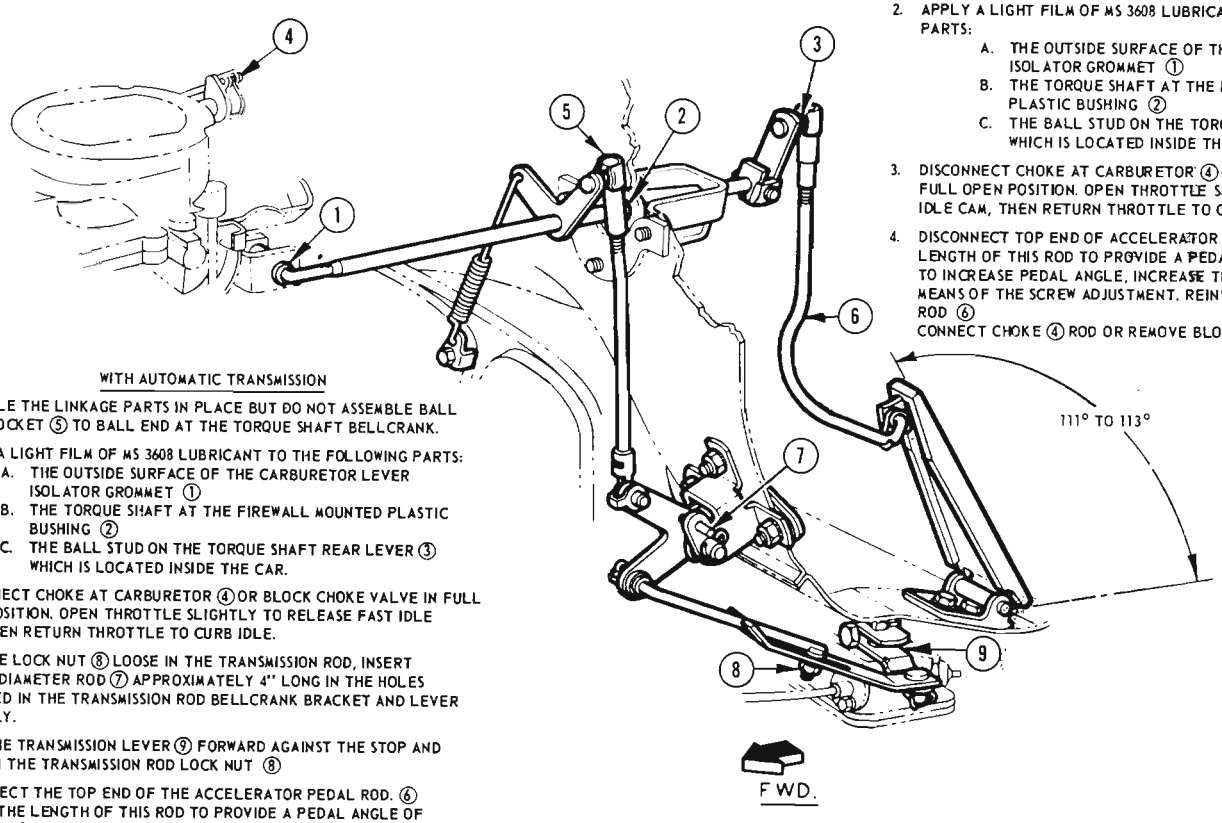


Fig. 23—Bottom View of Transmission (Pan Removed)



WITH AUTOMATIC TRANSMISSION

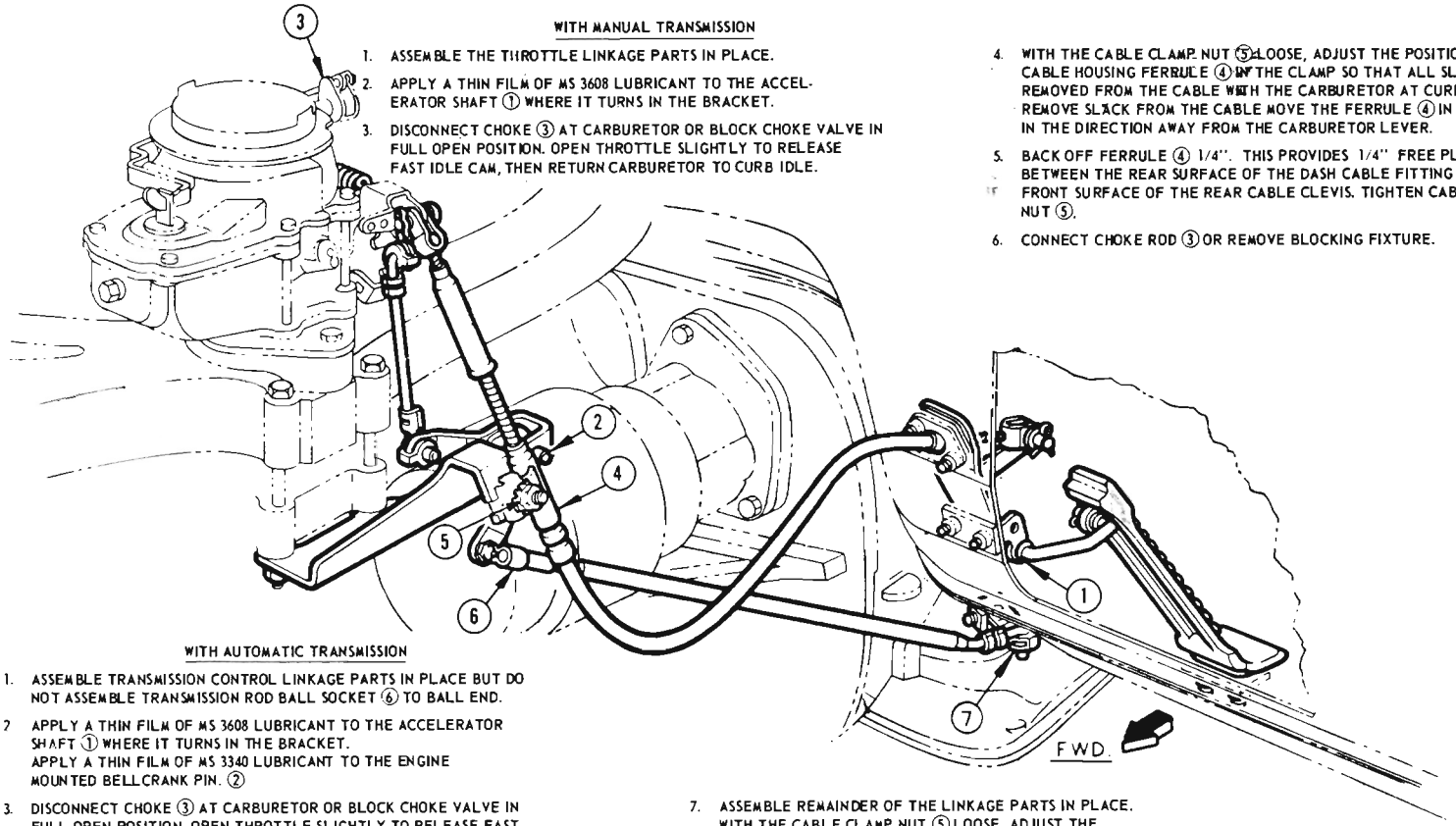
1. ASSEMBLE THE LINKAGE PARTS IN PLACE BUT DO NOT ASSEMBLE BALL JOINT SOCKET ⑤ TO BALL END AT THE TORQUE SHAFT BELLCRANK.
2. APPLY A LIGHT FILM OF MS 3608 LUBRICANT TO THE FOLLOWING PARTS:
   A. THE OUTSIDE SURFACE OF THE CARBURETOR LEVER ISOLATOR GROMMET ①
   B. THE TORQUE SHAFT AT THE FIREWALL MOUNTED PLASTIC BUSHING ②
   C. THE BALL STUD ON THE TORQUE SHAFT REAR LEVER ③ WHICH IS LOCATED INSIDE THE CAR.
3. DISCONNECT CHOKE AT CARBURETOR ④ OR BLOCK CHOKE VALVE IN FULL OPEN POSITION. OPEN THROTTLE SLIGHTLY TO RELEASE FAST IDLE CAM, THEN RETURN THROTTLE TO CURB IDLE.
4. WITH THE LOCK NUT ⑧ LOOSE IN THE TRANSMISSION ROD, INSERT A 3/16" DIAMETER ROD ⑦ APPROXIMATELY 4" LONG IN THE HOLES PROVIDED IN THE TRANSMISSION ROD BELLCRANK BRACKET AND LEVER ASSEMBLY.
5. MOVE THE TRANSMISSION LEVER ⑨ FORWARD AGAINST THE STOP AND TIGHTEN THE TRANSMISSION ROD LOCK NUT ⑧
6. DISCONNECT THE TOP END OF THE ACCELERATOR PEDAL ROD. ⑥ ADJUST THE LENGTH OF THIS ROD TO PROVIDE A PEDAL ANGLE OF 111° TO 113° TO INCREASE PEDAL ANGLE, INCREASE THE LENGTH OF THIS ROD BY MEANS OF THE SCREW ADJUSTMENT. REINSTALL THE TOP END OF THE ROD ⑥
7. REMOVE THE 3/16" DIAMETER ROD ⑦ FROM THE TRANSMISSION ROD BRACKET AND LEVER ASSEMBLY. ADJUST THE LENGTH OF THE TRANSMISSION BELLCRANK TO TORQUE SHAFT ROD BY MEANS OF THE SCREW ADJUSTMENT AT TOP END. THE CORRECT ROD LENGTH ALLOWS THE BALL SOCKET TO LINE UP WITH THE BALL END WHEN THE ROD IS HELD UPWARD AGAINST THE TRANSMISSION STOP.
8. INSTALL THE BALL SOCKET ON TORQUE SHAFT LEVER BALL END ⑤
9. CONNECT CHOKE ROD ④ OR REMOVE BLOCKING FIXTURE.

WITH MANUAL TRANSMISSION

1. ASSEMBLE THE THROTTLE LINKAGE PARTS IN PLACE.
2. APPLY A LIGHT FILM OF MS 3608 LUBRICANT TO THE FOLLOWING PARTS:
   A. THE OUTSIDE SURFACE OF THE CARBURETOR LEVER ISOLATOR GROMMET ①
   B. THE TORQUE SHAFT AT THE FIREWALL MOUNTED PLASTIC BUSHING ②
   C. THE BALL STUD ON THE TORQUE SHAFT REAR LEVER ③ WHICH IS LOCATED INSIDE THE CAR.
3. DISCONNECT CHOKE AT CARBURETOR ④ OR BLOCK CHOKE VALVE IN FULL OPEN POSITION. OPEN THROTTLE SLIGHTLY TO RELEASE FAST IDLE CAM, THEN RETURN THROTTLE TO CURB IDLE.
4. DISCONNECT TOP END OF ACCELERATOR PEDAL ROD. ⑥ ADJUST THE LENGTH OF THIS ROD TO PROVIDE A PEDAL ANGLE OF 111° TO 113°. TO INCREASE PEDAL ANGLE, INCREASE THE LENGTH OF THIS ROD BY MEANS OF THE SCREW ADJUSTMENT. REINSTALL THE TOP END OF THE ROD ⑥
   CONNECT CHOKE ④ ROD OR REMOVE BLOCKING FIXTURE.

63x363

Fig. 24—Throttle Linkage Adjustment (Valiant)



WITH MANUAL TRANSMISSION

1. ASSEMBLE THE THROTTLE LINKAGE PARTS IN PLACE.
2. APPLY A THIN FILM OF MS 3608 LUBRICANT TO THE ACCELERATOR SHAFT ① WHERE IT TURNS IN THE BRACKET.
3. DISCONNECT CHOKE ③ AT CARBURETOR OR BLOCK CHOKE VALVE IN FULL OPEN POSITION. OPEN THROTTLE SLIGHTLY TO RELEASE FAST IDLE CAM, THEN RETURN CARBURETOR TO CURB IDLE.
4. WITH THE CABLE CLAMP NUT ⑤ LOOSE, ADJUST THE POSITION OF THE CABLE HOUSING FERRULE ④ IN THE CLAMP SO THAT ALL SLACK IS REMOVED FROM THE CABLE WITH THE CARBURETOR AT CURB IDLE. TO REMOVE SLACK FROM THE CABLE MOVE THE FERRULE ④ IN THE CLAMP IN THE DIRECTION AWAY FROM THE CARBURETOR LEVER.
5. BACK OFF FERRULE ④ 1/4". THIS PROVIDES 1/4" FREE PLAY BETWEEN THE REAR SURFACE OF THE DASH CABLE FITTING AND THE FRONT SURFACE OF THE REAR CABLE CLEVIS. TIGHTEN CABLE CLAMP NUT ⑤.
6. CONNECT CHOKE ROD ③ OR REMOVE BLOCKING FIXTURE.

WITH AUTOMATIC TRANSMISSION

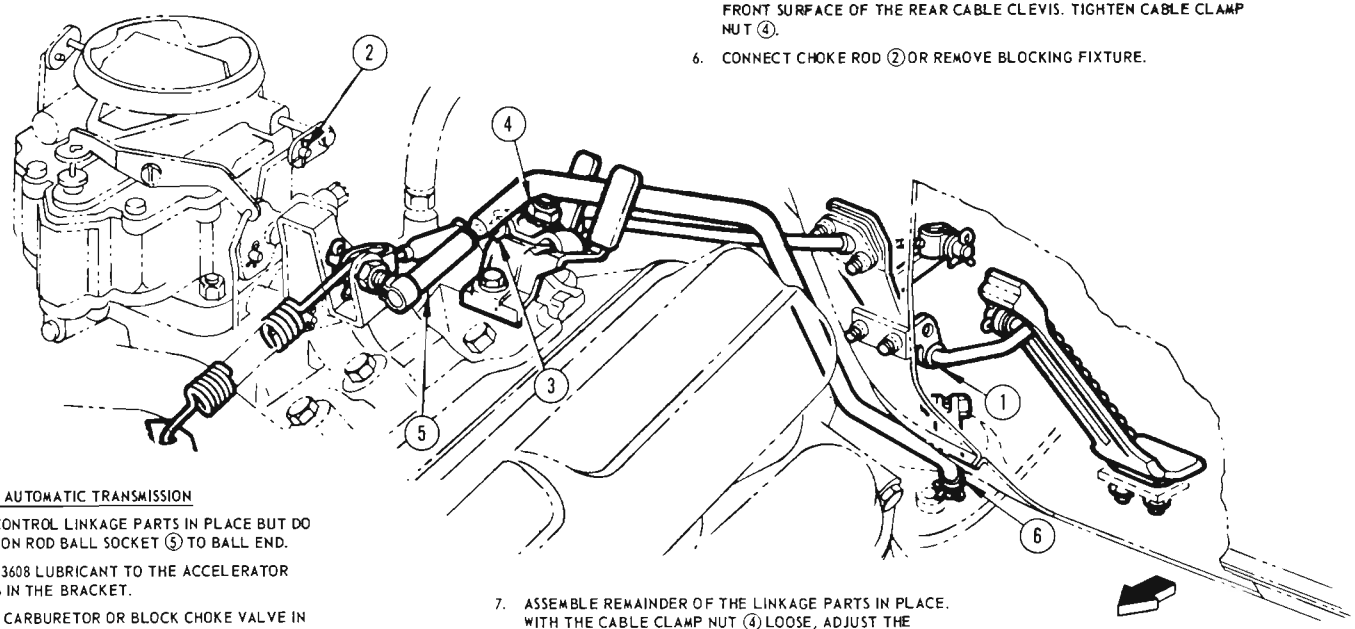
1. ASSEMBLE TRANSMISSION CONTROL LINKAGE PARTS IN PLACE BUT DO NOT ASSEMBLE TRANSMISSION ROD BALL SOCKET ⑥ TO BALL END.
2. APPLY A THIN FILM OF MS 3608 LUBRICANT TO THE ACCELERATOR SHAFT ① WHERE IT TURNS IN THE BRACKET. APPLY A THIN FILM OF MS 3340 LUBRICANT TO THE ENGINE MOUNTED BELLCRANK PIN. ②
3. DISCONNECT CHOKE ③ AT CARBURETOR OR BLOCK CHOKE VALVE IN FULL OPEN POSITION, OPEN THROTTLE SLIGHTLY TO RELEASE FAST IDLE CAM, THEN RETURN CARBURETOR TO CURB IDLE.
4. HOLD THE TRANSMISSION LEVER ⑦ FORWARD AGAINST ITS STOP AND ADJUST THE LENGTH OF THE TRANSMISSION ROD BY MEANS OF THE THREADED ADJUSTMENT ⑥ AT THE UPPER END. THE BALL SOCKET MUST LINE UP DIRECTLY WITH THE BALL END WITHOUT EXERTING ANY FORWARD FORCE ON THE ROD. THE BALL SOCKET MUST BE AT THE SAME HEIGHT AS THE BALL END WHEN CHECKING ROD LENGTH.
5. LENGTHEN ROD BY ONE TURN OF THE ADJUSTMENT. ⑥
6. ASSEMBLE BALL SOCKET ⑥ TO BALL END. WHEN THE CARBURETOR THROTTLE IS OPENED, THE TRANSMISSION SHOULD BEGIN ITS TRAVEL AT THE SAME TIME WITH NO VERTICAL MOVEMENT OF THE LEVER OR VERTICAL MOVEMENT OF THE ROD IN THE LEVER.
7. ASSEMBLE REMAINDER OF THE LINKAGE PARTS IN PLACE. WITH THE CABLE CLAMP NUT ⑤ LOOSE, ADJUST THE POSITION OF THE CABLE HOUSING FERRULE ④ IN THE CLAMP SO THAT ALL SLACK IS REMOVED FROM THE CABLE WITH THE CARBURETOR AT CURB IDLE. TO REMOVE SLACK FROM THE CABLE, MOVE THE FERRULE ④ IN THE CLAMP IN THE DIRECTION AWAY FROM THE CARBURETOR LEVER.
8. BACK OFF FERRULE ④ 1 4". THIS PROVIDES 1/4" FREE PLAY BETWEEN THE REAR SURFACE OF THE DASH CABLE FITTING AND THE FRONT SURFACE OF THE REAR CABLE CLEVIS. TIGHTEN CLAMP NUT ⑤.
9. ROUTE CABLE SO THAT IT DOES NOT INTERFERE WITH THE TRANSMISSION ROD THROUGHOUT ITS FULL TRAVEL.
10. CONNECT CHOKE ROD ③ OR REMOVE BLOCKING FIXTURE.

63x364 A

Fig. 25—Throttle Linkage Adjustment (Plymouth 6 Cyl.)

WITH MANUAL TRANSMISSION

1. ASSEMBLE THE THROTTLE LINKAGE PARTS IN PLACE.
2. APPLY A THIN FILM OF MS 3608 LUBRICANT TO THE ACCELERATOR SHAFT ① WHERE IT TURNS IN THE BRACKET.
3. DISCONNECT CHOKE ② AT CARBURETOR OR BLOCK CHOKE VALVE IN FULL OPEN POSITION. OPEN THROTTLE SLIGHTLY TO RELEASE FAST IDLE CAM, THEN RETURN CARBURETOR TO CURB IDLE.
4. WITH THE CABLE CLAMP NUT ④ LOOSE, ADJUST THE POSITION OF THE CABLE HOUSING FERRULE ③ IN THE CLAMP SO THAT ALL SLACK IS REMOVED FROM THE CABLE WITH THE CARBURETOR AT CURB IDLE. TO REMOVE SLACK FROM THE CABLE MOVE THE FERRULE ③ IN THE CLAMP IN THE DIRECTION AWAY FROM THE CARBURETOR LEVER.
5. BACK OFF FERRULE ③ 1/4". THIS PROVIDES 1/4" FREE PLAY BETWEEN THE REAR SURFACE OF THE DASH CABLE FITTING AND THE FRONT SURFACE OF THE REAR CABLE CLEVIS. TIGHTEN CABLE CLAMP NUT ④.
6. CONNECT CHOKE ROD ② OR REMOVE BLOCKING FIXTURE.



WITH AUTOMATIC TRANSMISSION

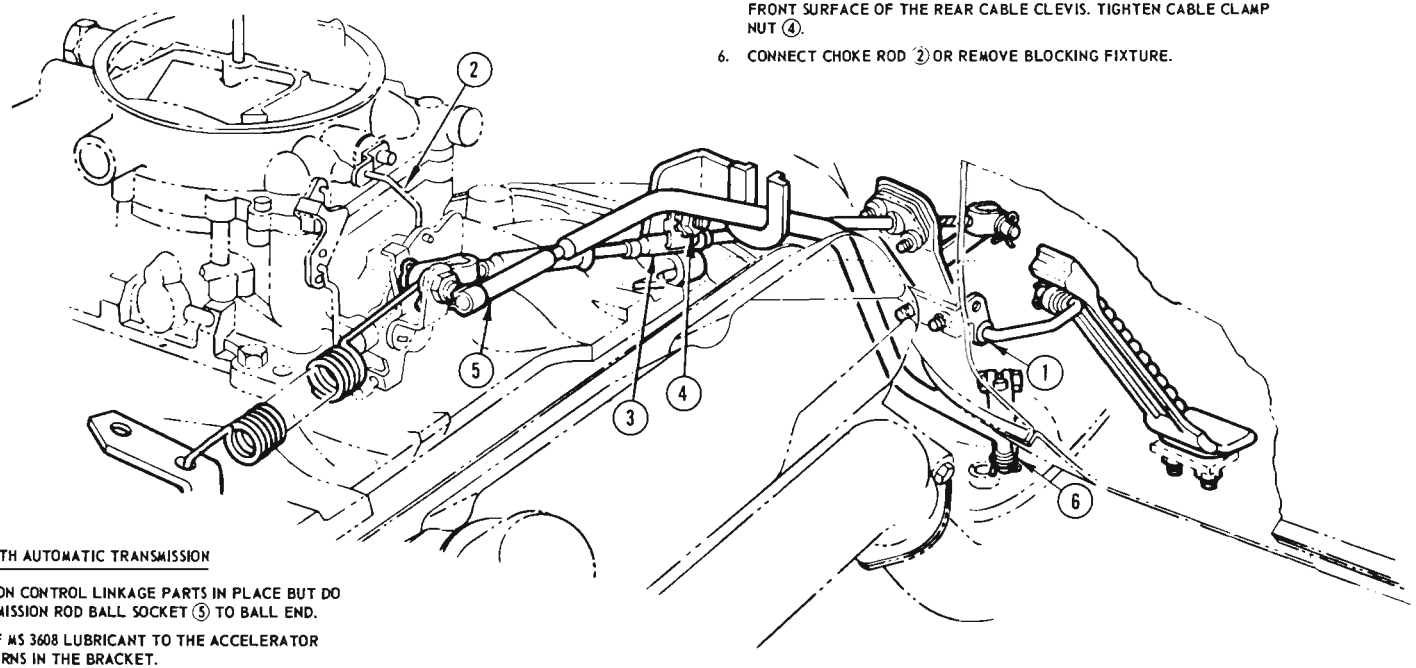
1. ASSEMBLE TRANSMISSION CONTROL LINKAGE PARTS IN PLACE BUT DO NOT ASSEMBLE TRANSMISSION ROD BALL SOCKET ⑤ TO BALL END.
2. APPLY A THIN FILM OF MS 3608 LUBRICANT TO THE ACCELERATOR SHAFT ① WHERE IT TURNS IN THE BRACKET.
3. DISCONNECT CHOKE ② AT CARBURETOR OR BLOCK CHOKE VALVE IN FULL OPEN POSITION, OPEN THROTTLE SLIGHTLY TO RELEASE FAST IDLE CAM, THEN RETURN CARBURETOR TO CURB IDLE.
4. HOLD THE TRANSMISSION LEVER ⑥ FORWARD AGAINST ITS STOP AND ADJUST THE LENGTH OF THE TRANSMISSION ROD BY MEANS OF THE THREADED ADJUSTMENT ⑤ AT THE UPPER END. THE BALL SOCKET MUST LINE UP DIRECTLY WITH THE BALL END WITHOUT EXERTING ANY FORWARD FORCE ON THE ROD. THE BALL SOCKET MUST BE AT THE SAME HEIGHT AS THE BALL END WHEN CHECKING ROD LENGTH.
5. LENGTHEN ROD BY ONE TURN OF THE ADJUSTMENT. ⑤
6. ASSEMBLE BALL SOCKET ⑤ TO BALL END. WHEN THE CARBURETOR THROTTLE IS OPENED, THE TRANSMISSION SHOULD BEGIN ITS TRAVEL AT THE SAME TIME WITH NO VERTICAL MOVEMENT OF THE LEVER OR VERTICAL MOVEMENT OF THE ROD IN THE LEVER.
7. ASSEMBLE REMAINDER OF THE LINKAGE PARTS IN PLACE. WITH THE CABLE CLAMP NUT ④ LOOSE, ADJUST THE POSITION OF THE CABLE HOUSING FERRULE ③ IN THE CLAMP SO THAT ALL SLACK IS REMOVED FROM THE CABLE WITH THE CARBURETOR AT CURB IDLE. TO REMOVE SLACK FROM THE CABLE, MOVE THE FERRULE ③ IN THE CLAMP IN THE DIRECTION AWAY FROM THE CARBURETOR LEVER.
8. BACK OFF FERRULE ③ 1/4". THIS PROVIDES 1/4" FREE PLAY BETWEEN THE REAR SURFACE OF THE DASH CABLE FITTING AND THE FRONT SURFACE OF THE REAR CABLE CLEVIS. TIGHTEN CLAMP NUT ④.
9. ROUTE CABLE SO THAT IT DOES NOT INTERFERE WITH THE TRANSMISSION ROD THROUGHOUT ITS FULL TRAVEL.
10. CONNECT CHOKE ROD ② OR REMOVE BLOCKING FIXTURE.

63x365A

Fig. 26—Throttle Linkage Adjustment (318 Cu. In. Eng.)

WITH MANUAL TRANSMISSION

1. ASSEMBLE THE THROTTLE LINKAGE PARTS IN PLACE.
2. APPLY A THIN FILM OF MS 3608 LUBRICANT TO THE ACCELERATOR SHAFT (1) WHERE IT TURNS IN THE BRACKET.
3. DISCONNECT CHOKE (2) AT CARBURETOR OR BLOCK CHOKE VALVE IN FULL OPEN POSITION. OPEN THROTTLE SLIGHTLY TO RELEASE FAST IDLE CAM, THEN RETURN CARBURETOR TO CURB IDLE.
4. WITH THE CABLE CLAMP NUT (4) LOOSE, ADJUST THE POSITION OF THE CABLE HOUSING FERRULE (3) IN THE CLAMP SO THAT ALL SLACK IS REMOVED FROM THE CABLE WITH THE CARBURETOR AT CURB IDLE. TO REMOVE SLACK FROM THE CABLE MOVE THE FERRULE (3) IN THE CLAMP IN THE DIRECTION AWAY FROM THE CARBURETOR LEVER.
5. BACK OFF FERRULE (3) 1/4". THIS PROVIDES 1/4" FREE PLAY BETWEEN THE REAR SURFACE OF THE DASH CABLE FITTING AND THE FRONT SURFACE OF THE REAR CABLE CLEVIS. TIGHTEN CABLE CLAMP NUT (4).
6. CONNECT CHOKE ROD (2) OR REMOVE BLOCKING FIXTURE.



WITH AUTOMATIC TRANSMISSION

1. ASSEMBLE TRANSMISSION CONTROL LINKAGE PARTS IN PLACE BUT DO NOT ASSEMBLE TRANSMISSION ROD BALL SOCKET (5) TO BALL END.
2. APPLY A THIN FILM OF MS 3608 LUBRICANT TO THE ACCELERATOR SHAFT (1) WHERE IT TURNS IN THE BRACKET.
3. DISCONNECT CHOKE (2) AT CARBURETOR OR BLOCK CHOKE VALVE IN FULL OPEN POSITION, OPEN THROTTLE SLIGHTLY TO RELEASE FAST IDLE CAM, THEN RETURN CARBURETOR TO CURB IDLE.
4. HOLD THE TRANSMISSION LEVER (6) FORWARD AGAINST ITS STOP AND ADJUST THE LENGTH OF THE TRANSMISSION ROD BY MEANS OF THE THREADED ADJUSTMENT (5) AT THE UPPER END. THE BALL SOCKET MUST LINE UP DIRECTLY WITH THE BALL END WITHOUT EXERTING ANY FORWARD FORCE ON THE ROD. THE BALL SOCKET MUST BE AT THE SAME HEIGHT AS THE BALL END WHEN CHECKING ROD LENGTH.
5. LENGTHEN ROD BY ONE TURN OF THE ADJUSTMENT. (5)
6. ASSEMBLE BALL SOCKET (5) TO BALL END. WHEN THE CARBURETOR THROTTLE IS OPENED, THE TRANSMISSION SHOULD BEGIN ITS TRAVEL AT THE SAME TIME WITH NO VERTICAL MOVEMENT OF THE LEVER OR VERTICAL MOVEMENT OF THE ROD IN THE LEVER.
7. ASSEMBLE REMAINDER OF THE LINKAGE PARTS IN PLACE. WITH THE CABLE CLAMP NUT (4) LOOSE, ADJUST THE POSITION OF THE CABLE HOUSING FERRULE (3) IN THE CLAMP SO THAT ALL SLACK IS REMOVED FROM THE CABLE WITH THE CARBURETOR AT CURB IDLE. TO REMOVE SLACK FROM THE CABLE, MOVE THE FERRULE (3) IN THE CLAMP IN THE DIRECTION AWAY FROM THE CARBURETOR LEVER.
8. BACK OFF FERRULE (3) 1/4". THIS PROVIDES 1/4" FREE PLAY BETWEEN THE REAR SURFACE OF THE DASH CABLE FITTING AND THE FRONT SURFACE OF THE REAR CABLE CLEVIS. TIGHTEN CLAMP NUT (4).
9. ROUTE CABLE SO THAT IT DOES NOT INTERFERE WITH THE TRANSMISSION ROD THROUGHOUT ITS FULL TRAVEL.
10. CONNECT CHOKE ROD (2) OR REMOVE BLOCKING FIXTURE..

63x366A

Fig. 27—Throttle Linkage Adjustment (361-383-426 Cu. In. Eng.)

Eight Cylinder Cars: Back off the adjusting screw 3 turns. Hold adjusting screw in this position and tighten the lock nut to 35 foot-pounds torque.

(5) Reinstall the oil pan using a new gasket. Tighten the oil pan bolts to 150 inch-pounds torque.

(6) Fill the transmission with Automatic Transmission Fluid Type "A" Suffix "A". Refer to Paragraph 4.

13. THROTTLE LINKAGE ADJUSTMENT

(1) With the engine at operating temperature and the carburetor off the fast idle cam, adjust the idle speed to 500 rpm, (use tachometer).

(2) Adjust the throttle linkage, as outlined and illustrated in Figures 24, 25, 26 or 27.

14. HYDRAULIC CONTROL PRESSURE TESTS

Line Pressure and Front Servo Release Pressure

Line pressure and front servo release pressure tests must be made in D (drive) position with the rear wheels free to turn. The transmission fluid must be at operating temperature (150 to 200° F).

(1) Install an engine tachometer, raise the vehicle on a hoist and position the tachometer so it can be read under the vehicle.

(2) Connect two 0-100 psi pressure gauges, Tool C-3292 to the pressure take-off-points at the side of the accumulator and at the front servo release (Fig. 28).

(3) With the control in D (drive) position, speed up the engine slightly until the transmission shifts into direct. (Front servo release will be pressurized in direct.) Reduce the engine speed slowly to 1,000 rpm. Line pressure at this time (1,000 rpm) must be 54-60 psi, and the front servo release pressure must not be more than 3 psi below the line pressure.

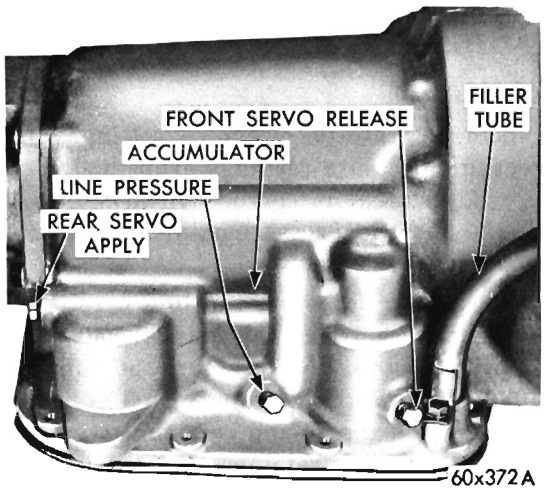


Fig. 28—Pressure Test Locations (Right Side of Case)

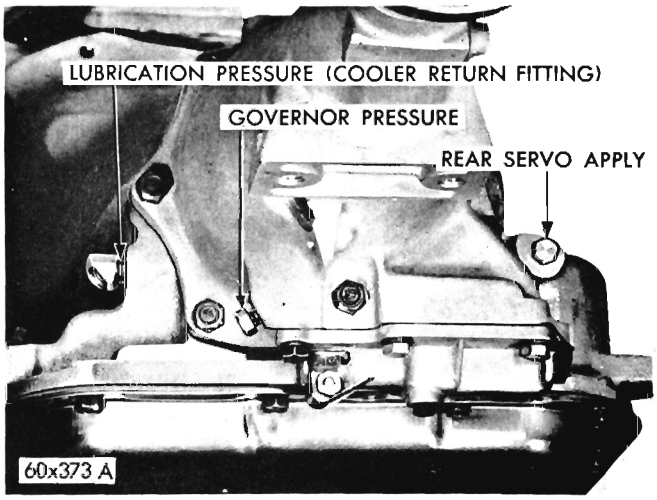


Fig. 29—Pressure Test Locations (Rear End of Case)

(4) Disconnect the throttle linkage from the transmission throttle lever and move the throttle lever gradually to the full throttle position. Line pressure must rise to a maximum of 90-96 psi just before or at kickdown into low gear. Front servo release pressure must follow the line pressure up to the kickdown point and should not be more than 3 psi below the line pressure.

If the pressure is not 54-60 psi at 1,000 rpm, adjust the pressure, as outlined in Paragraph 15.

If the front servo release pressures are less than the pressures specified and line pressures are within limits, there is excessive leakage in the front clutch and/or front servo circuits. **Always inspect the external transmission throttle lever for looseness on the valve body shaft when making the pressure tests.**

Lubrication Pressures

The lubrication pressure test should be made at the same time that line pressure and front servo release pressure are tested.

(1) Install a "tee" fitting between the cooler return line fitting and the fitting hole in the transmission case at the rear of left side of the transmission (Fig. 29). Connect a 0-100 psi pressure gauge, Tool C-3292 to the "tee" fitting.

(2) At 1,000 engine rpm, with the throttle closed and transmission in direct, lubrication pressure should be 5-15 psi. Lubrication pressure will be approximately doubled as the throttle is opened to maximum line pressure.

Rear Servo Apply Pressure

(1) Connect a 0-300 psi pressure gauge, Tool C-3293

to the apply pressure take-off point at the rear servo (Fig. 29).

(2) With the transmission control in R (reverse) position and the engine speed set at 1600 rpm, the reverse servo apply pressure should be 240-280 psi.

Governor Pressure

(1) Connect a 0-100 psi pressure gauge, Tool C-3292 to the governor pressure take-off point, located at the lower left side of the extension near the mounting flange (Fig. 29).

(2) Governor pressures should fall within the limits given in the "Governor Pressure Chart".

If the governor pressures are incorrect at the given vehicle speeds, the governor valve and/or weights are probably sticking.

GOVERNOR PRESSURE CHART
(170 Cubic Inch Engine—Valiant)

Car Speed (Axle Ratio)		Pressure Limits
3.23-1	**3.55-1**	**PSI**
16-17	14-15	15
29-39	27-35	45
59-66	54-60	75

GOVERNOR PRESSURE CHART
(225 Cubic Inch Engine—Valiant)

Car Speed (Axle Ratio)			Pressure Limits
2.93-1	**3.23-1**	**3.55-1**	**PSI**
17-19	15-17	14-15	15
29-38	26-34	24-31	45
60-69	55-63	50-57	75

GOVERNOR PRESSURE CHART
(225 Cubic Inch Engine—Plymouth 6)

Car Speed (Axle Ratio)				Pressure Limits
2.93-1	**3.23-1**	**3.31-1**	**3.55-1**	**PSI**
18-20	16-18	16-18	15-17	15
30-40	27-36	25-35	25-33	45
63-73	57-67	56-65	53-61	75

GOVERNOR PRESSURE CHART
(318, 361, 383 Cu. In. Engine—Plymouth 8)

Car Speed (Axle Ratio) Standard		Hi Performance		Pressure Limits
2.76-1	**3.23-1**	**2.93-1**	**3.23-1**	**PSI**
19-21	16-18	17-20	16-18	15
41-51	35-44	38-48	35-43	50
69-76	59-65	65-72	59-65	75

GOVERNOR PRESSURE CHART
(426 Cubic Inch Engine—Plymouth 8)

Car Speed (Axle Ratio)		Pressure Limits
3.23-1	**3.91-1**	**PSI**
15-18	12-15	15
56-63	46-52	50
82-90	68-74	75

NOTE: The governor pressure should respond smoothly to changes in mph and should return to 0 to 1½ psi when the vehicle is stopped. High pressure at stand still (above 2 psi) will prevent the transmission from downshifting.

Throttle Pressure

No provisions are made to test the throttle pressure. Incorrect throttle pressure should only be suspected if the part throttle shift speeds are either very delayed or occur too early in relation to vehicle speeds. In which case, the throttle linkage should be adjusted before throttle pressure setting is adjusted. Refer to Paragraphs 13 and 15.

15. HYDRAULIC CONTROL PRESSURE ADJUSTMENTS

Line Pressure

An incorrect throttle pressure setting will cause incorrect line pressure readings even though the line pressure adjustment is correct. Always inspect and correct the throttle pressure adjustment before adjusting the line pressure.

NOTE: Before adjusting the line pressure, measure the distance between the manual valve (valve in 1-low position) and line pressure adjusting screw (Fig. 30). This measurement must be 1⅞ inches; correct by loosening the spring retainer screws and repositioning the spring retainer. The regulator valve may cock and hang up in its bore if the spring retainer is out of position.

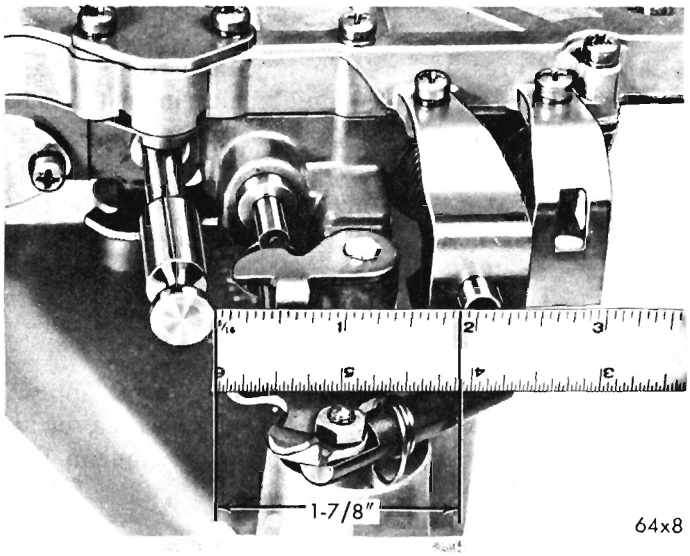


Fig. 30—Measuring Spring Retainer Location

If the line pressure is not correct, it will be necessary to remove the valve body assembly to perform the adjustment. (Refer to Paragraph 24.)

The approximate adjustment is 1-5/16 inches, measured from the valve body to the inner edge of the adjusting nut (Fig. 31). However, due to manufacturing tolerances, the adjustment can be varied to obtain the specified line pressure.

The adjusting screw may be turned with an Allen wrench. One complete turn of the adjusting screw changes closed throttle line pressure approximately 1⅔ psi. Turning the adjusting screw counter-clockwise increases pressure, and clockwise decreases the pressure.

Throttle Pressure

Throttle pressures cannot be tested accurately; therefore, the adjustment should be tested if a malfunction is evident.

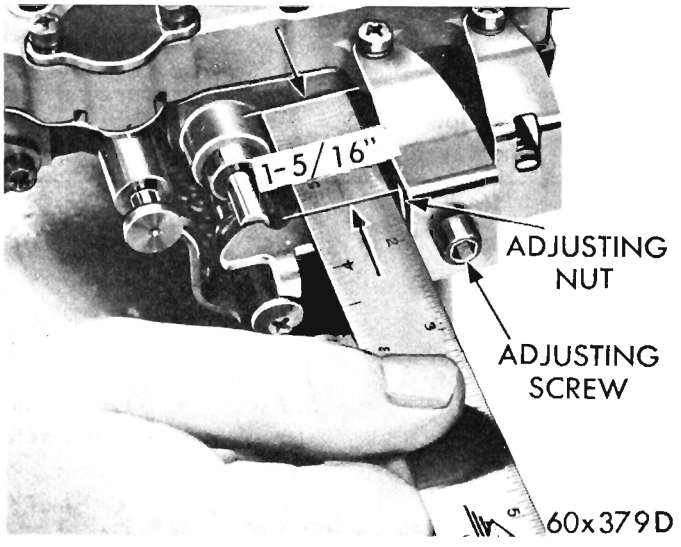


Fig. 31—Line Pressure Adjustment

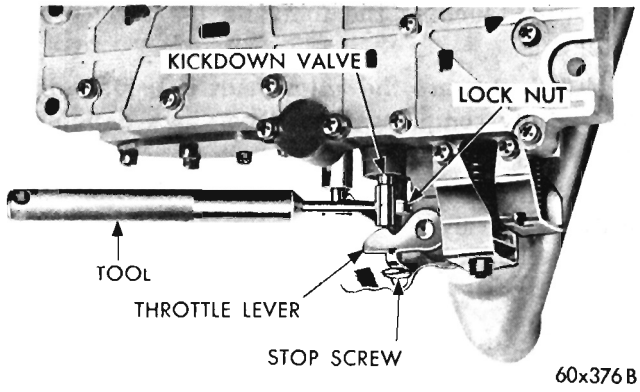


Fig. 32—Throttle Pressure Adjustment

(1) Remove the valve body assembly from the transmission to perform the adjustment. (Refer to Paragraph 24.)

(2) Loosen the throttle lever stop screw lock nut and back off approximately five turns (Fig. 32).

(3) Insert gauge pin of Tool C-3763 between the throttle lever cam and the kickdown valve.

(4) By pushing in on the tool, compress the kickdown valve against its spring so the throttle valve is completely bottomed inside the valve body.

(5) As force is being exerted to compress the spring, tighten the throttle lever stop screw finger tight against the throttle lever tang with the throttle

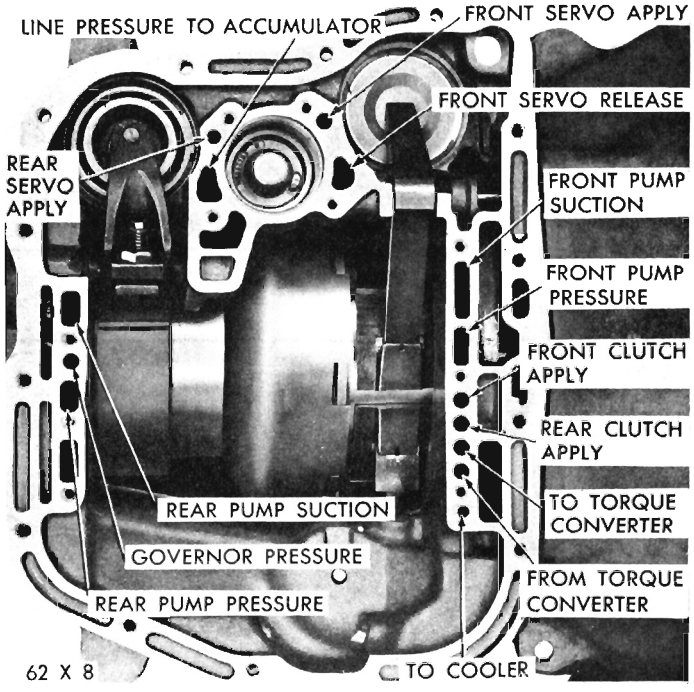


Fig. 33—Air Pressure Tests

lever cam touching the tool and the throttle valve bottomed.

NOTE: Be sure the adjustment is made with the spring fully compressed and the valve bottomed in the valve body.

(6) Remove the tool and tighten the stop screw lock nut securely.

16. AIR PRESSURE TESTS

A **"NO DRIVE"** condition might exist even with correct fluid pressure, because of inoperative clutches or bands. The inoperative units, clutches, bands and servos can be located through a series of tests by substituting air pressure for the fluid pressure (Fig. 33). The front and rear clutches, kickdown servo, and low-reverse servo may be tested by applying air pressure to their respective passages after the valve body assembly has been removed. (Refer to Paragraph 24.) To make the air pressure tests, proceed as follows:

CAUTION: Compressed air supply must be free of all dirt or moisture. Use a pressure of 30 to 100 psi.

Front Clutch

Apply air pressure to the front clutch "apply" passage and listen for a dull "thud" which indicates that the front clutch is operating. Hold the air pressure on for a few seconds and inspect the system for excessive oil leaks.

Rear Clutch

Apply air pressure to the rear clutch "apply" passage and listen for a dull "thud" which indicates that the rear clutch is operating. Also inspect for excessive oil leaks.

NOTE: If a dull "thud" cannot be heard in the clutches, place the finger tips on the clutch housing and again apply air pressure. Movement of the piston can be felt as the clutch is applied.

Kickdown Servo

Direct air pressure into the front servo "apply" passage. Operation of the servo is indicated by a tightening of the front band. Spring tension on the servo piston should release the band.

Low and Reverse Servo

Direct air pressure into the rear servo "apply" passage. Operation of the servo is indicated by a tightening of the rear band. Spring tension on the servo piston should release the band.

If the clutches and servos operate properly, no unshift or erratic shift conditions indicate that the malfunctions exist in the control valve body assembly.

Governor

Governor operating failures can generally be diagnosed by a road test or hydraulic pressure test. (Refer to Paragraph 14.)

SPEEDOMETER PINION USAGE CHART

TORQUEFLITE

Model	Tire Size	Axle Ratio	Engine No. Cyl.	Output Shaft Teeth	Pinion Teeth	Pinion Color
Valiant						
VV-1	650-13	2.93:1	6	7	17	Orange
		3.23:1	6	7	19	Dark Blue
		3.55:1	6	7	20	Green
Plymouth	700-14	2.76:1	6	7	16	Brown
VP-1		2.93:1	6	7	16	Brown
		3.23:1	6	7	18	Dark Purple
		3.31:1	6	7	18	Dark Purple
Plymouth	700-14	2.76:1	8	8	17	Orange
VP-2		2.93:1	8	8	18	Dark Purple
		3.23:1	8	8	20	Green
		3.55:1	8	8	20	Green

SERVICING OPERATIONS WITH TRANSMISSION IN VEHICLE

Various transmission components can be removed for repairs without removing the transmission from the vehicle. The removal, reconditioning and installation procedures for these components are covered here, except the valve body reconditioning, which is described in Paragraph 31.

Heli-Coil inserts are recommended for repairing damaged, stripped or worn threads in the aluminum parts. (Refer to Paragraph 27.)

SERVICE PROCEDURES

17. SPEEDOMETER PINION

Removal and Installation

(1) Remove the screw and retainer securing the speedometer cable to the extension housing. Carefully work the pinion and sleeve assembly out of the housing (Fig. 34).

(2) To replace the pinion and/or oil seal, pry the clip off the pinion and slide the pinion assembly off the cable. Install a new seal on the cable housing.

(3) If transmission fluid is found in the cable housing, replace the seal inside the pinion bore (Fig. 35). Pry the old seal out of the pinion bore. Place a new seal on the end of the cable with the lip toward the cable, then slide the pinion over the seal and cable. Secure with the spring clip.

(4) To install, push the pinion and sleeve assembly into the extension housing so the sleeve flange is tight against the housing, then install the retainer and screw. Tighten the screw to 150 inch-pounds torque.

18. OUTPUT SHAFT OIL SEAL

Replacement

(1) Disconnect the propeller shaft at the transmission flange.

(2) Hold the transmission flange with Tool C-3281 and remove the retaining nut and washer (Fig. 36). Slide the flange off the output shaft. (Use puller, Tool C-452 if necessary.)

(3) **Six Cylinder Vehicles:** Drive Tool C-3899 through the output shaft oil seal to remove the rubber lips from the seal (Fig. 37). Screw taper threaded end

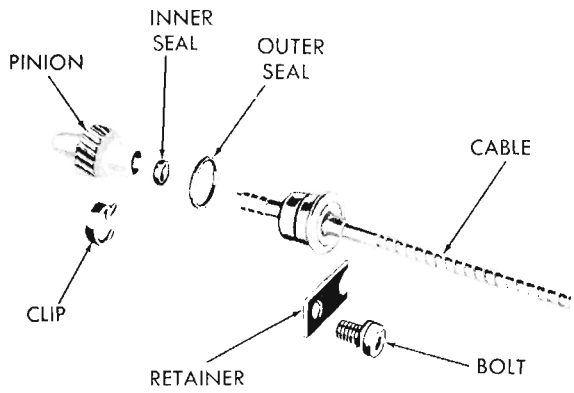


Fig. 35—Speedometer Pinion (Disassembled)

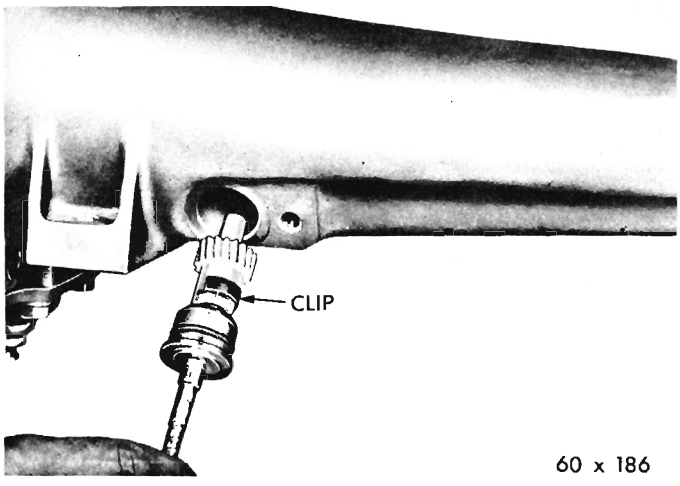


Fig. 34—Removing or Installing Speedometer Pinion

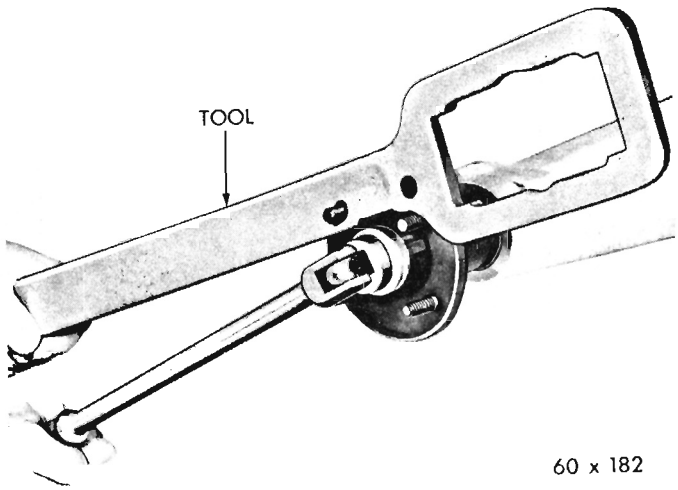


Fig. 36—Removing or Installing Output Shaft Flange Nut

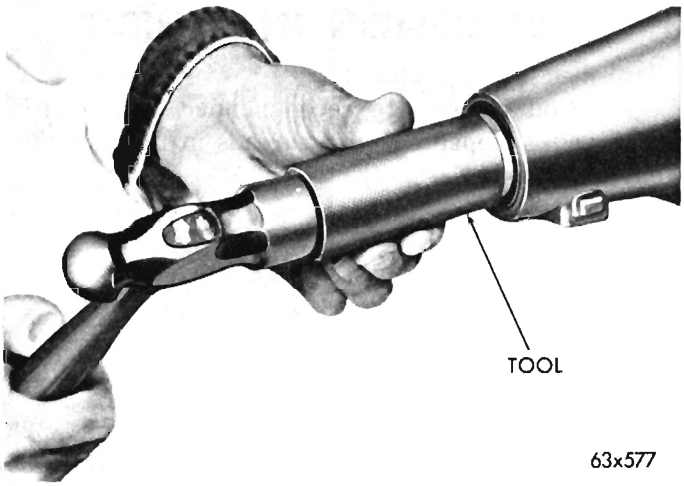


Fig. 37—Removing Rubber Lip from Output Shaft Seal (Six Cylinder Cars)

of the Tool C-3753 into the seal (Fig. 38), then tighten the screw of the tool to remove the seal. Blow loose particles of the old seal out of the extension housing.

Eight Cylinder Vehicles: Screw taper threaded end of Tool C-748 into the seal (Fig. 38), then tighten the screw of tool to remove the seal.

(4) **Six Cylinder Vehicles:** To install a new seal, slide protector sleeve Tool C-3768 over the output shaft splines, then drive in the seal (lip side facing inward) with Tool C-3754 (Fig. 39).

Eight Cylinder Vehicles: To install a new seal, position the seal in opening of extension housing with lip of the seal facing inward. Drive the seal into housing with Tool C-3837 (Fig. 40).

(5) Install the transmission output shaft flange. Install the washer with its three projections toward the flange and the nut with its convoluted surface contacting the washer. Hold the flange with Tool C-3281, and tighten the nut to 175 foot-pounds torque.

(6) Connect the propeller shaft to the transmission flange.

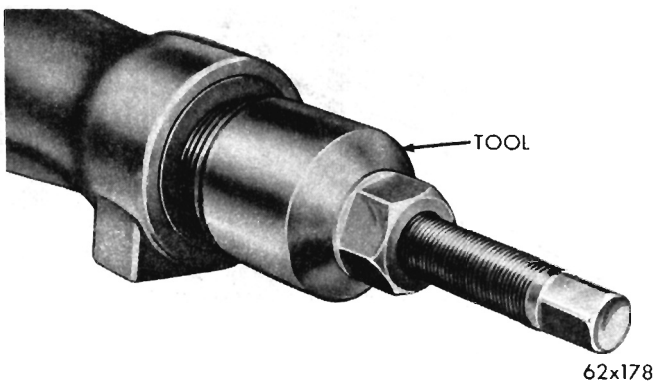


Fig. 38—Removing Output Shaft Oil Seal

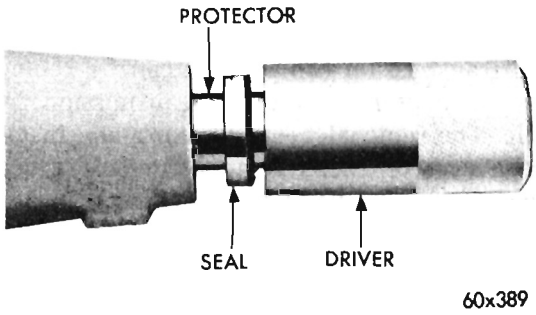


Fig. 39—Installing Output Shaft Oil Seal (Six Cylinder Cars)

19. EXTENSION HOUSING

Removal

(1) Remove the speedometer drive pinion and sleeve assembly. (See Paragraph 17.)

(2) Remove the transmission flange. (See Paragraph 18.)

(3) Drain approximately two quarts of fluid from the transmission.

(4) Loosen the parking lock cable clamp bolt where the cable enters the housing cover. Refer to Fig. 19. Tap the end of clamp bolt lightly to release its hold on the cable. Remove the housing cover lower plug. Insert a screw driver through the hole, then while exerting pressure against the projecting portion of the cable lock-spring, withdraw the lock cable.

(5) Remove the two bolts securing the extension housing to the crossmember insulator.

(6) Raise the transmission slightly to clear the crossmember with service jack, Tool C-3203A. Remove the crossmember attaching bolts and remove the crossmember, insulator and spring assembly.

(7) Remove the extension housing to transmission bolts, tap the housing lightly with a soft mallet to break it loose from the transmission, then remove the housing.

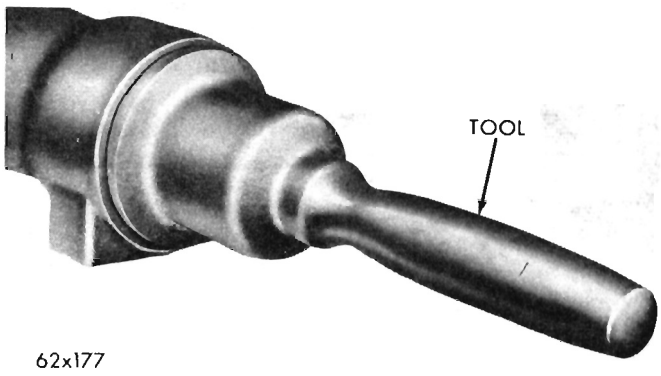


Fig. 40—Installing Output Shaft Oil Seal (Eight Cylinder Cars)

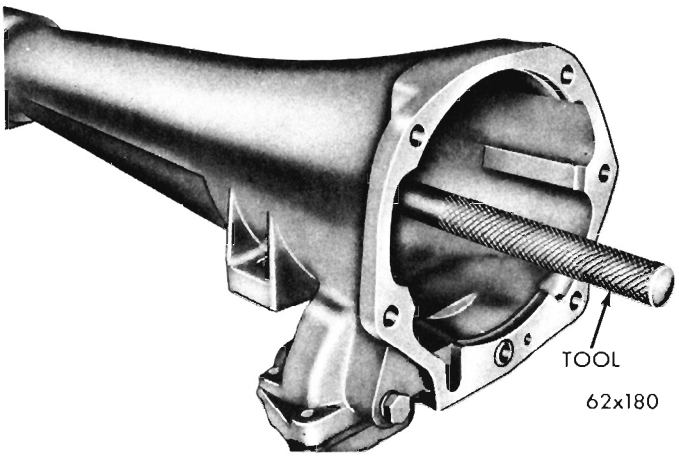


Fig. 41—Removing Output Shaft Bearing (Eight Cylinder Cars)

Bearing Replacement (Eight Cylinder Vehicles)

Note: To replace the bushing in the transmission extension housing, (Six Cylinder vehicles) refer to "Recondition Sub-Assemblies", Paragraph 33.

(1) Pry or drive the oil seal out of the extension housing with a long blunt drift. Be sure not to mar the oil seal surface in the housing.

(2) Remove the bearing snap ring from the extension housing. Drive the bearing rearward out of the housing with Tool C-3275 (Fig. 41).

(3) Place a new bearing in the opening of the extension housing. Using Tool C-3204, drive the bearing into housing (Fig. 42). Install the bearing retaining snap ring.

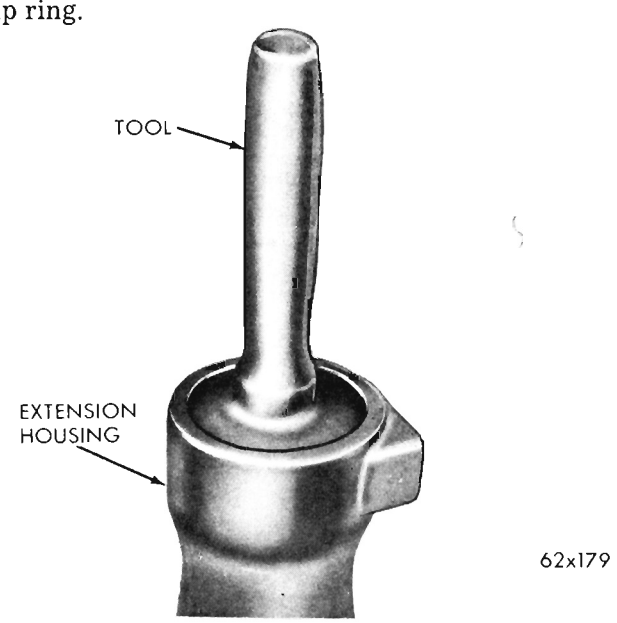


Fig. 42—Installing Output Shaft Bearing (Eight Cylinder Cars)

(4) Place a new seal in the opening of the extension housing (lip of seal facing inward). Using Tool C-3837, drive the seal into the housing until tool bottoms (Fig. 40).

Installation

(1) Using a new gasket, carefully slide the extension housing into place, install the retaining bolts and washers, tighten bolts to 24 foot-pounds torque.

(2) Install the crossmember, insulator and spring assembly. Tighten the crossmember attaching bolts to 75 foot-pounds torque. Lower the transmission so the extension housing rests on, and is aligned with the insulator. Install the insulator to extension housing bolts and tighten to 35 foot-pounds torque.

(3) Install and adjust the parking lock cable. (Refer to Paragraph 10.)

(4) Install the transmission flange and connect the propeller shaft. Refer to Paragraph 18, (Step 5.)

(5) Install the speedometer drive pinion and sleeve.

(6) Add fluid to the transmission to bring it up to the proper level. (Refer to Paragraph 4.)

20. GOVERNOR

Removal

(1) Remove the extension housing. (See Paragraph 19.)

(2) Using a screw driver carefully pry the snap ring from the weight end of the governor valve shaft (Fig. 43). Slide the valve and shaft assembly out of governor body.

(3) Remove the large snap ring from weight end of the governor body, lift out the governor weight assembly.

(4) Remove the snap ring from inside the governor

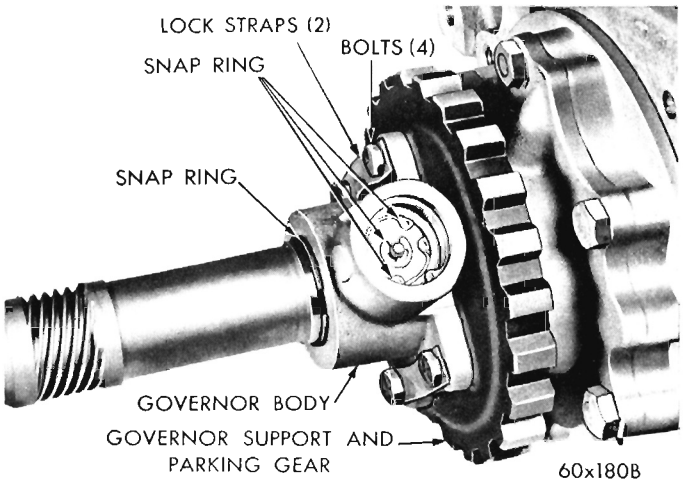


Fig. 43—Governor Shaft and Weight Snap Rings

weight, remove inner weight and spring from the outer weight. Figure 44 shows a disassembled view of the governor assembly.

(5) Remove the snap ring from behind the governor body, then slide the governor and support assembly off the output shaft. If necessary remove the four bolts and separate governor body from the support.

Cleaning and Inspection

The primary cause of the governor operating failure is due to a sticking governor valve or weights. Rough surfaces may be removed with crocus cloth. Thoroughly clean all parts in clean solvent and inspect for free movement before assembly.

Installation

(1) Assemble the governor body to the support (if disassembled) and tighten bolts finger tight. Make sure oil passage of the governor body aligns with passage in the support.

(2) Position the support and governor assembly on the output shaft. Align the assembly so the governor valve shaft hole in the governor body aligns with the hole in the output shaft, then slide the assembly into place. Install snap ring behind the governor body (Fig. 43). Tighten the body to support bolts to 100 inch-pounds torque. Bend ends of lock straps over the bolt heads.

(3) Assemble the governor weights and spring, and secure with snap ring inside of the large governor weight. Place the weight assembly in the governor body and install snap ring.

(4) Place the governor valve on the valve shaft, insert the assembly into the body and through the governor weights. Install the valve shaft retaining snap ring. Inspect the valve and weight assembly for free movement after installation.

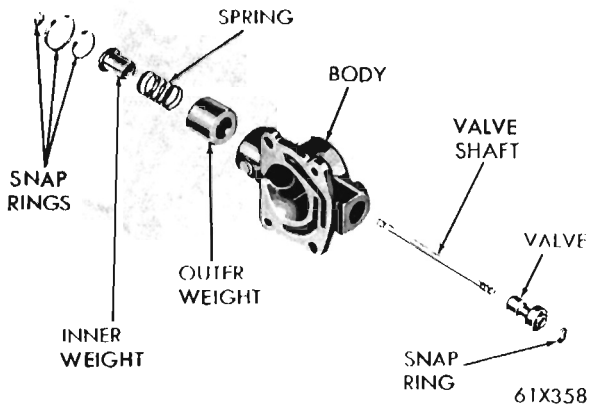


Fig. 44—Governor Assembly (Disassembled)

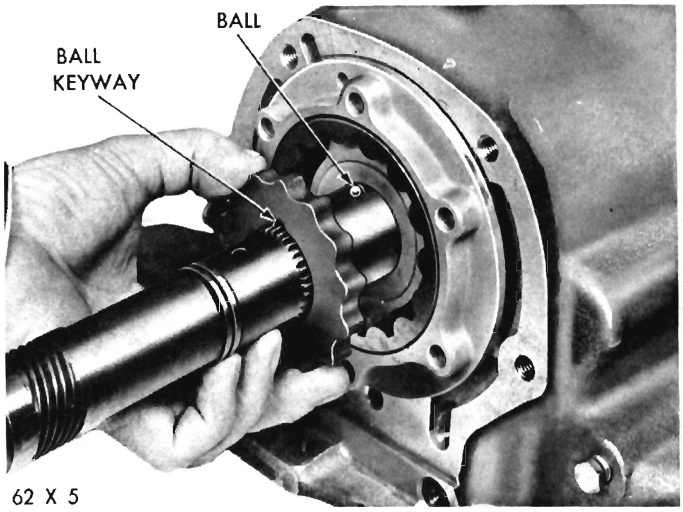


Fig. 45—Removing or Installing Rear Oil Pump Inner Rotor

(5) Install the extension housing, transmission flange and connect the propeller shaft.

(6) Connect and adjust the parking lock cable. (Refer to Paragraph 10).

21. REAR OIL PUMP

Removal

(1) Remove the extension housing. See Paragraph 19.

(2) Remove the governor and support. See Paragraph 20.

(3) Unscrew the rear oil pump cover retaining bolts and remove the cover.

(4) The oil pump inner rotor is keyed to the output shaft by a small ball, therefore, use care in sliding out the inner rotor so as not to lose the ball (Fig. 45). Remove the outer rotor from the pump body.

NOTE: If the rear oil pump body requires replacement, it will be necessary to disassemble the transmission as the pump body must be driven rearward out of the case with a wood block.

Inspection

Inspect the oil pump body and cover machined surfaces for nicks and burrs. Inspect the rotors for scoring or pitting. With the gears cleaned and installed in the pump body, place a straight edge across the face of rotors and pump body. Using a feeler gauge, measure the clearance between the straight edge and face of the rotors. Clearance limits are from .0015 to .003 inch.

Installation

(1) Place the outer rotor in the pump body.

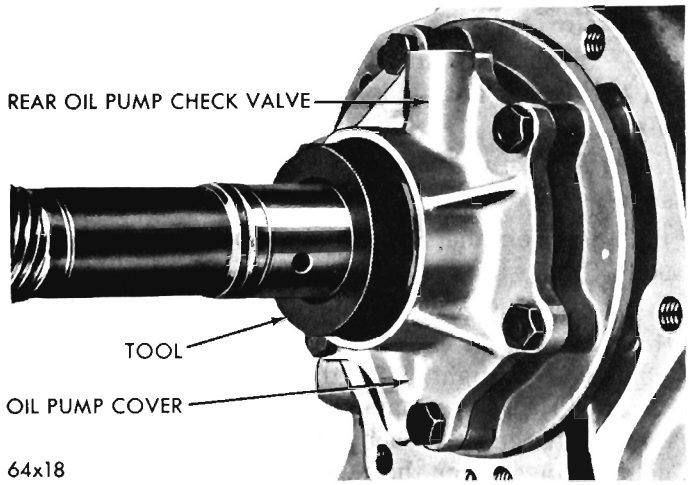


Fig. 46—Aligning Rear Oil Pump Cover

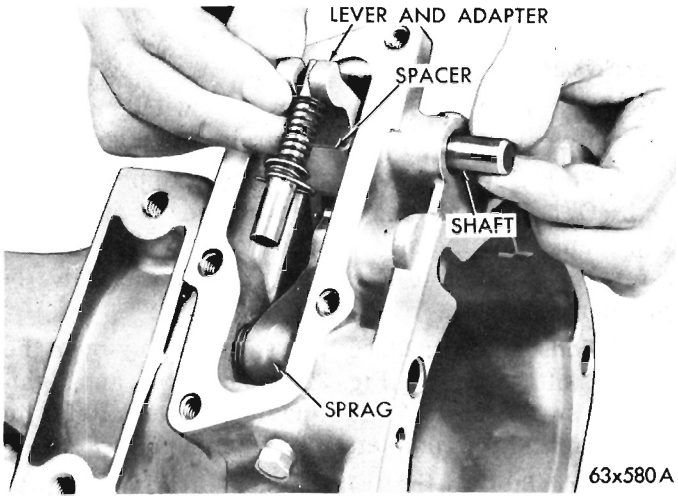


Fig. 47—Removing or Installing Parking Lock Lever and Cable Adapter

(2) Turn the output shaft so the inner rotor driving ball pocket is up. Install the ball and slide the inner rotor on the output shaft in alignment with the ball (Fig. 45).

(3) Install the oil pump cover with the retaining bolts threaded in a few turns. Slide the aligning fixture Tool C-3864 (8-cylinder vehicles) or Tool C-3762 (6- cylinder vehicles) all the way in until it bottoms against the rotors (Fig. 46), then retighten the cover bolts evenly to 140 inch-pounds torque.

(4) Install the governor and support. (See Paragraph 20.)

(5) Install the extension housing, transmission flange and connect the propeller shaft.

(6) Connect the parking lock cable.

22. PARKING LOCK COMPONENTS

Removal

(1) Remove the extension housing. See Paragraph 19.

(2) To replace the parking lock support gear, refer to Paragraph 20.

(3) Remove the parking lock cable adapter cover from the bottom of the extension housing.

(4) Remove the plug from the extension housing, slide out the shaft to remove the parking lock lever, spacer and cable adapter (Fig. 47). Replace the adapter spring if it is distorted.

(5) Slide the bushing sleeve out of the housing to remove the parking sprag and spring (Fig. 48).

Installation

(1) Position the parking sprag and spring in the housing and insert the bushing sleeve (Fig. 48). Make sure the square lug on the sprag is toward the support gear and the spring is positioned so as to lift the sprag away from the gear.

(2) Position the lock lever, spacer and cable adapter assembly in the extension housing and install the lever shaft (Fig. 47). The lever roller must be on top of the sprag so as to push it into engagement with the support gear. Install and tighten the plug to 150 inch-pounds torque.

(3) Insert a small punch through the cable opening in the adapter cover and into end of the adapter. Carefully lower the cover into position, feeding the adapter into the cable opening in the cover. Install the cover retaining screws and tighten to 150 inch-pounds torque.

(4) Install the extension housing, transmission flange and connect the propeller shaft.

(5) Connect the parking lock cable. (See Paragraph 10.)

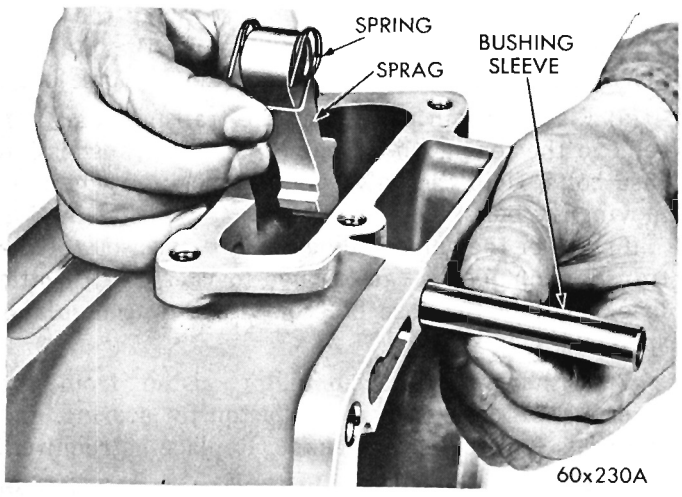


Fig. 48—Removing or Installing Parking Sprag

23. NEUTRAL STARTING SWITCH

Replacement

(1) Disconnect the wire from the switch, unscrew the switch allowing the fluid to drain into a container.

(2) **Push Button Control:** Place the cupped washer and "O" ring over the threads of the switch (Fig. 21), then screw the switch into the transmission case a few turns. Refer to Paragraph 11 for complete Adjustment and Test.

(3) **Console Shift**: Place the seal assembly over the threads of the switch (Fig. 22), then install and tighten the switch 25 to 35 foot-pounds torque. Refer to Paragraph 11 for complete adjustment and test.

(4) Add fluid to the transmission to bring it up to proper level. Refer to Paragraph 4.

NOTE: Test the starter for operating in all push button or selecter lever positions. If it should operate in any position other than push button neutral or selector lever park and neutral, readjust the gearshift control cable. Refer to Paragraph 9. In some cases, it may be necessary to align the valve body neutral and/or park fingers with the switch plunger. Refer to Paragraph 24.

24. VALVE BODY ASSEMBLY AND ACCUMULATOR PISTON

Removal

(1) Raise the vehicle on a hoist.

(2) Loosen the oil pan bolts, tap the pan to break it loose allowing the fluid to drain, then remove the oil pan.

(3) Loosen the clamp bolt and lift the throttle lever and washer off the transmission throttle lever shaft.

(4) Disconnect the gearshift control cable. Refer to Paragraph 9. Shift the valve body manual lever to the 1 (low) position to expose the nut securing the cable adapter to the lever (Fig. 23). Remove the nut and disengage the cable adapter from the manual lever.

(5) Place a drain pan under the transmission, then remove the ten hex-head valve body to transmission case bolts. Hold the valve body in position while removing the bolts.

(6) Lower the valve body assembly down out of the transmission, being careful not to cock the throttle lever shaft in the case hole or lose the accumulator spring.

(7) Withdraw the accumulator piston from the transmission case. Inspect the piston for scoring, and the rings for wear or breakage. Replace as required.

NOTE: Servicing the valve body assembly is outlined in Paragraph 31.

Installation

(1) Clean the mating surfaces and inspect for burrs on both the transmission case and valve body steel plate.

(2) Install the accumulator piston in the transmission case.

(3) Position the accumulator spring on the valve body.

(4) Carefully position the valve body assembly in the transmission case, install the retaining bolts and tighten finger tight. With the neutral starting switch installed, place the manual valve in the neutral position. Shift the valve body if necessary to center the neutral finger over the neutral switch plunger. Snug the bolts down evenly, then tighten to 100 inch-pounds torque.

(5) Connect the control cable adapter to the valve body manual lever and install the retaining nut. Connect the gearshift control cable. Refer to Paragraph 9.

(6) Install the seal, flat washer and throttle lever on the throttle shaft. Tighten the clamping bolt. Inspect the throttle lever for looseness by forcing it in both directions.

(7) Install the oil pan, using a new gasket.

(8) Add fluid to the transmission to bring it up to proper level. (Refer to Paragraph 4.)

25. TRANSMISSION AND CONVERTER REMOVAL AND INSTALLATION

CAUTION: The transmission and converter must be removed and installed as an assembly; otherwise, the converter drive plate, front pump bushing, and oil seal will be damaged. The drive plate will not support a load; therefore, none of the weight of the transmission should be allowed to rest on the plate during removal or installation.

Removal

(1) Connect a remote control starter switch, Tool C-763 to the starter solenoid and position the switch so the engine can be rotated from under the vehicle.

(2) Disconnect the high tension wire from the distributor cap.

(3) Place the parking lock lever (if so equipped) in the **OFF** position, then raise the vehicle on a hoist or support with stands.

(4) Remove the cover plate from in front of the converter assembly to provide access to the converter drain plug and mounting bolts.

(5) Rotate the engine with the remote control switch to bring the drain plug to "6 o'clock" position. Drain the torque converter and transmission.

(6) Mark the converter and drive plate to aid in reassembly. The crankshaft flange bolt circle, the inner and outer circle of holes in the drive plate, and the four tapped holes in the front face of the converter all have one hole offset so these parts will be installed in the original position. This maintains the balance of the engine and converter.

(7) Rotate the engine with the remote control switch to locate two converter to drive plate bolts at "5 and 7 o'clock" positions. Remove the two bolts rotate the engine with switch and remove the other two bolts.

CAUTION: Do not rotate the converter or drive plate by prying with a screw driver or similar tool as the drive plate might become distorted. Also, the starter should never be engaged if the drive plate is not attached to the converter with at least one bolt or if the transmission case to engine bolts have been loosened.

(8) Disconnect the negative (ground) cable from the battery.

(9) Remove the starting motor assembly.

(10) Disconnect the wire from the neutral starting switch.

(11) Remove the push button gearshift control cable to transmission adjusting wheel lock screw. Pull the control cable out of the transmission case as far as possible, back off the adjusting wheel a few turns if necessary.

(12) Insert a small screw driver above and slightly to the right of the control cable (Fig. 18). Disengage the cable adapter lock spring by pushing the screw driver handle to the right while pulling outward on the cable.

(13) Disconnect the throttle rod from the throttle lever on the transmission.

(14) Disconnect the oil cooler lines at the transmission and remove the oil filler tube.

(15) Remove the speedometer pinion and sleeve assembly from the transmission (Fig. 34).

(16) Loosen the transmission parking lock cable clamp bolt where the cable enters the cover (Fig. 19). Tap the end of the clamp bolt lightly to release its hold on the cable. Remove the housing cover lower plug. Insert a screw driver through the hole, then gently exert pressure against the projecting portion of the cable lock-spring and withdraw the lock cable.

(17) Disconnect the front universal joint and secure the propeller shaft out of the way.

(18) Remove the two bolts securing the extension housing to the crossmember insulator.

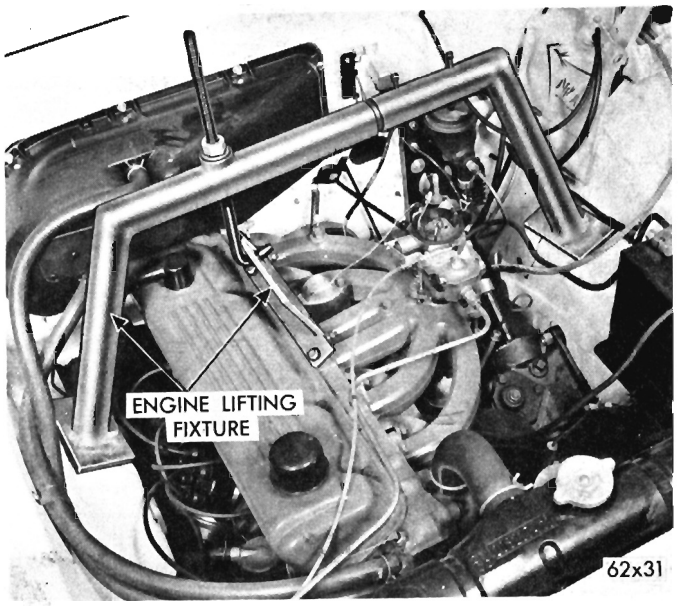


Fig. 49—Engine Lifting Fixture (6 Cyl. Engine)

(19) Install an engine support fixture, Tool C-3487 (8 cyl. engine) or Tool C-3809 (6 cyl. engine) and raise the engine slightly (Fig. 49 or 50).

(20) Remove the crossmember attaching bolts and remove the crossmember, insulator and spring assembly.

(21) Place a transmission service jack under the transmission to support the assembly.

(22) Attach a small "C" clamp to edge of the bell housing to hold the converter in place during removal of the transmission.

(23) Remove the bell housing retaining bolts. Carefully work the transmission rearward off the engine block dowels and disengage the converter hub from the end of the crankshaft.

(24) Lower the transmission jack and remove the transmission and converter assembly.

(25) To remove the converter assembly, remove the

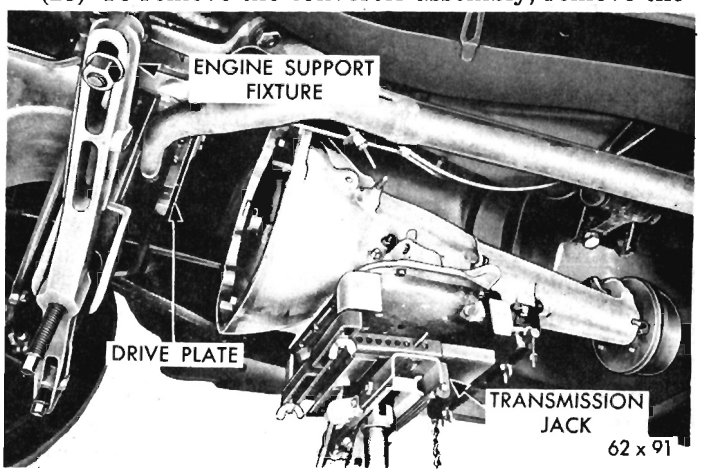


Fig. 50—Engine Lifting Fixture (8 Cyl. Engine)

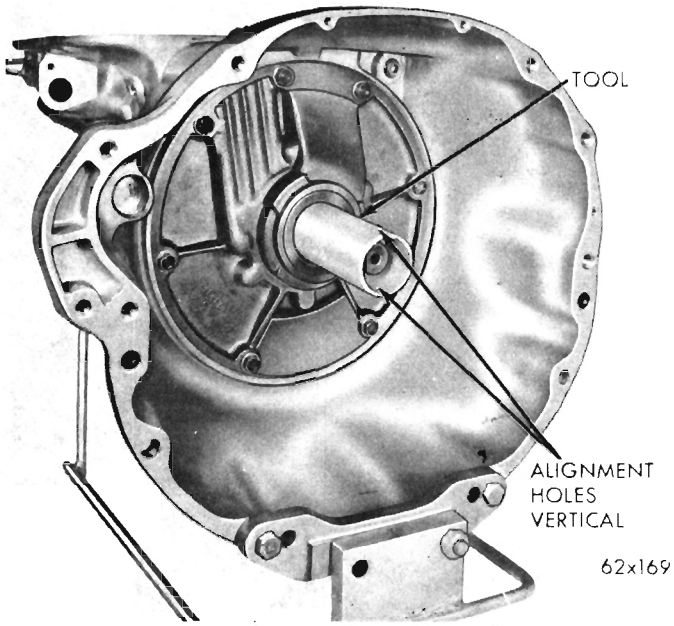


Fig. 51—Aligning Front Pump Rotors

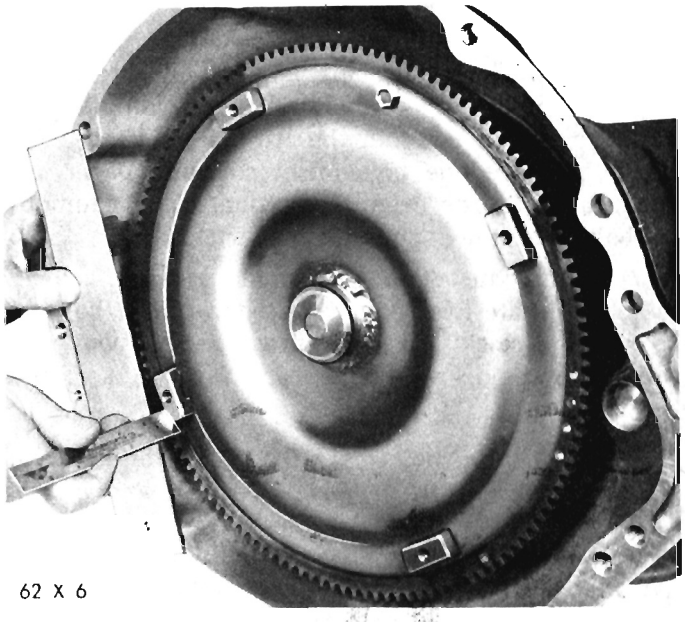


Fig. 52—Measuring Converter for Full Engagement in Transmission

"C" clamp from the edge of the bell housing, then carefully slide the assembly out of the transmission.

Converter Installation

(1) Rotate the front pump rotors with Tool C-3756 (Six Cylinder Vehicles) or Tool C-3881 (Eight Cylinder Vehicles) until the two small holes in the handle are vertical (Fig. 51).

(2) Carefully slide the converter assembly over the input shaft and reaction shaft. Make sure the converter impeller shaft slots are also vertical and fully engage the front pump inner rotor lugs.

Test for full engagement by placing a straight edge on the face of the case (Fig. 52). The surface of the converter front cover lug should be at least ½ inch to the rear of the straight edge when the converter is pushed all the way into the transmission.

(3) Attach a small "C" clamp to the edge of the bell housing to hold the converter in place during the transmission installation.

Installation

(1) Inspect the converter drive plate for distortion or cracks and replace if necessary.

(2) Coat the converter hub hole in the crankshaft with wheel bearing grease. Place the transmission and converter assembly on a service jack and position the assembly under the vehicle for installation. Raise or tilt as necessary until the transmission is aligned with the engine.

(3) Rotate the converter so the mark on the converter (made during removal) will align with the mark on the drive plate. The offset holes in the plate are located next to the ⅛ inch hole in the inner circle of the plate. A stamped V mark identifies the offset hole in the converter front cover (Fig. 53). Carefully work the transmission assembly forward over the engine block dowels with the converter hub entering the crankshaft opening.

(4) After the transmission is in position, install the bell housing bolts and tighten 25 to 30 foot-pounds torque.

(5) Install and tighten the two lower drive plate to converter bolts to 270 inch-pounds torque.

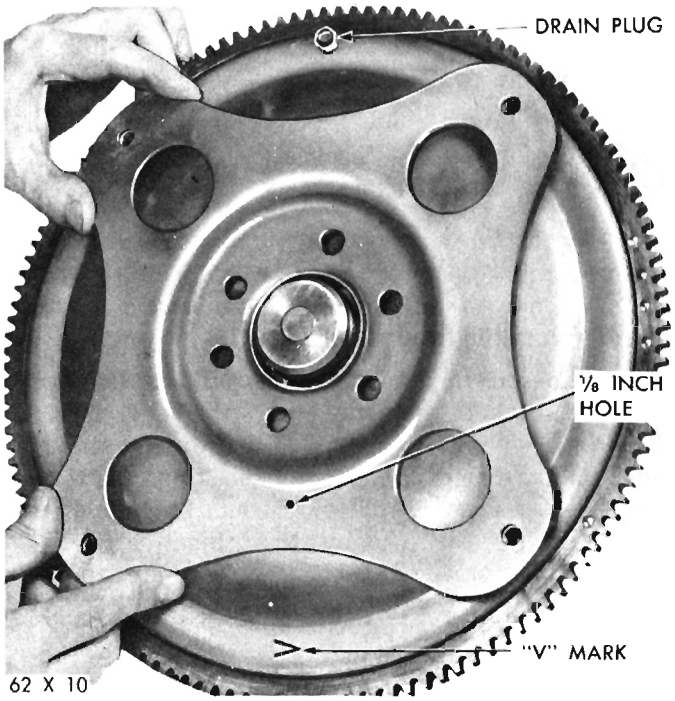


Fig. 53—Converter and Drive Plate Markings

(6) Install the starting motor and connect the battery ground cable.

(7) Rotate the engine with the remove control switch and install the other two drive plate to converter bolts. Tighten the bolts to 270 inch-pounds torque.

(8) Install the crossmember, insulator and spring assembly. Tighten the crossmember attaching bolts to 75 foot-pounds torque. Lower the transmission so the extension housing rests on, and is aligned with the insulator. Install the insulator to extension housing bolts and tighten to 35 foot-pounds torque.

(9) Insert a screw driver through the parking lock cover plug opening and position it behind the cable adapter stop washer (Fig. 20). Hold the adapter outward while pushing the cable in as far as possible, making sure the lock-spring engages the cable. Gently pull outward on the cable housing to its limit of travel, release, then tighten the clamp bolt to 10 inch-pounds torque. Remove the screw driver and reinstall the plug in the cover.

(10) Connect the propeller shaft to the front companion flange.

(11) Install the speedometer drive pinion and sleeve.

(12) Connect the oil cooler lines to the transmission and install the oil filler tube.

(13) Connect the throttle rod to the transmission throttle lever.

(14) Have an assistant engage and hold in firmly, the R (reverse) button or place the console selector lever in the park position. Insert the control cable in the transmission case, push inward on the cable making sure the lock spring engages the cable. Install the control cable adjusting wheel lock screw.

(15) Connect the wire to the neutral starting swtich.

(16) Install the cover plate in front of the converter assembly.

(17) .Install the transmission case to cylinder block brace.

NOTE: The converter cover plate must be between the case and the brace. The oil line bracket is attached in front of the brace. Tighten the bolts holding the brace to the case before attaching brace to the cylinder block.

(18) Refill the transmission with Automatic Transmission Fluid Type "A" Suffix "A". Refer to Paragraph 4 for complete transmission filling instructions.

NOTE: To completely adjust the throttle linkage, gearshift control cable, and neutral starting switch, refer to "Maintenance, Adjustments and Tests", Paragraphs 9, 11 and 13.

RECONDITION THE TRANSMISSION UNIT OUT OF THE VEHICLE

The following reconditioning paragraphs cover the removal, disassembly, inspection, repair, assembly and installation procedures for each sub-assembly in detail.

In the event that any part has failed in the transmission, the torque converter should be flushed to insure that fine metal particles are not later transferred back into the reconditioned transmission.

SERVICE PROCEDURES

26. FLUSHING THE TORQUE CONVERTER

The torque converter **must be removed** from the vehicle for flushing, as the converter should never be rotated by the starter with the transmission removed.

(1) Place the torque converter in an upright position and pour two quarts of new clean solvent or kerosene into the converter through the impeller hub.

(2) Turn and shake the converter so as to swirl the solvent through the internal parts. Turning the turbine and stator with the transmission input and reaction shafts will aid in dislodging foreign material.

(3) Position the converter in its normal operating position with the drain plug at the lowest point. Remove the drain plug and drain the solvent. Rotate the turbine and stator, and shake the converter while draining to prevent dirt particles from settling.

(4) Repeat the flushing operation at least once, or as many times as required until the solvent or kerosene drained out is clear.

(5) After flushing, shake and rotate the converter several times with the drain plug out to remove any residual solvent and dirt. Flush any remaining solvent from the converter with two quarts of new transmission fluid. This will prevent any adverse effect the solvent may have on the transmission seals. Reinstall the drain plug and tighten to 14 foot-pounds torque.

27. ALUMINUM THREAD REPAIR

Damaged or worn threads in the aluminum transmission case and valve body can be repaired by the use of Heli-Coils. Essentially, this repair consists of drilling out the worn or damaged threads, tapping the hole with a special Heli-Coil Tap, and installing a Heli-Coil insert into the tapped hole. This brings the hole back to its original thread size.

The chart lists the threaded hole sizes which are used in the aluminum case and valve body, and the necessary tools and inserts for the repair of damaged or worn threads. Heli-Coil tools and inserts are readily available from most automotive parts jobbers.

NOTE: Some thread drag may occur in screwing a bolt into the installed Heli-Coil insert. Therefore, a torque reading should be taken of the thread drag with an inch-pound torque wrench and added to the specified bolt torque, so that all bolts securing a particular part will be tightened to the same torque.

28. FRONT PUMP OIL SEAL

Replacement

The front pump oil seal can be replaced without removing the front pump and reaction shaft support assembly from the transmission case.

NOTE: The vent shield is not used or required on the (Six Cylinder Vehicles) front pump. See Figures 54 and 55.

HELI-COIL CHART

HELI-COIL INSERT			DRILL	TAP	INSERTING TOOL	EXTRACTING TOOL
Thread Size	Part No.	Insert Length	Size	Part No.	Part No.	Part No.
10-24	1185-3	.285"	13/64" (.203")	3 CPB	528-3N	1227-6
1/4-20	1185-4	3/8"	17/64" (.265")	4 CPB	528-4N	1227-6
5/16-18	1185-5	15/32"	Q (.332")	5 CPB	528-5N	1227-6
3/8-16	1185-6	9/16"	X (.397")	6 CPB	528-6N	1227-6
7/16-14	1185-7	21/32"	29/32" (.453")	7 CPB	528-7N	1227-16

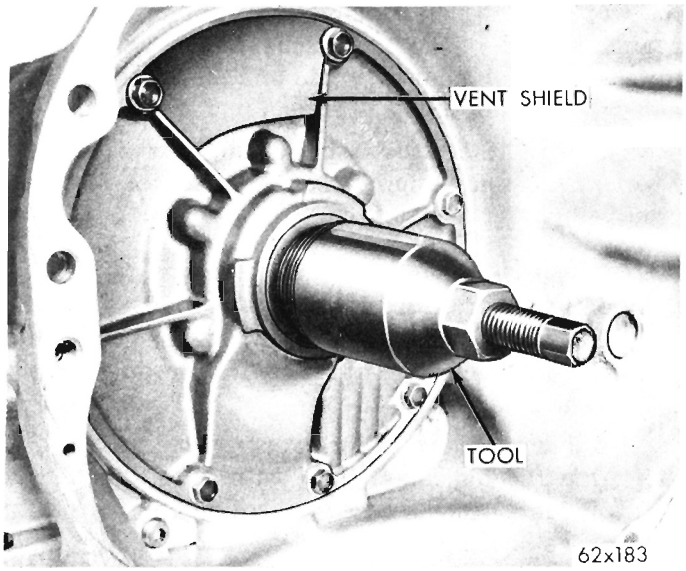


Fig. 54—Removing Front Pump Oil Seal

(1) Screw seal remover Tool C-3758 (Six Cylinder Vehicles) or Tool C-3861 (Eight Cylinder Vehicles) into the seal (Fig. 54). Tighten screw portion of the tool to withdraw the seal.

(2) To install a new seal, place the seal in the opening of the pump housing (lip side facing inward). Using Tool C-3757 (Six Cylinder Vehicles) or Tool C-3860 (Eight Cylinder Vehicles), drive seal into housing until the tool bottoms (Fig. 55).

29. REMOVAL OF SUB-ASSEMBLIES

Prior to removing any of the transmission sub-assemblies, plug all the openings and thoroughly clean the exterior of the unit, preferably by steam. Cleanliness through the entire disassembly and assembly cannot be over-emphasized. When disassembling, each part should be washed in a suitable solvent, then dried by compressed air. **Do not wipe parts with shop towels**. All of the mating surfaces in the transmission are accurately machined; therefore, careful handling of parts must be exercised to avoid nicks or burrs.

Oil Pan

(1) Place the transmission assembly in a repair stand, Tool C-3750 with adapter C-3882 (Fig. 56). **The adapter is not used with the Six Cylinder Vehicle transmission.**

(2) Unscrew the oil pan bolts and remove the oil pan and gasket.

Valve Body Assembly

(1) Unscrew the nut and remove the control cable adapter from the valve body manual lever (Fig. 23).

(2) Remove the ten hex-head valve body asssembly to transmission case bolts (Fig. 23). Hold the valve body in position while removing the bolts.

(3) Lift the valve body asssembly out of the transmission case, being careful not to cock the throttle lever shaft.

Accumulator Piston and Spring

(1) Lift the spring off the accumulator piston and withdraw the piston from the case.

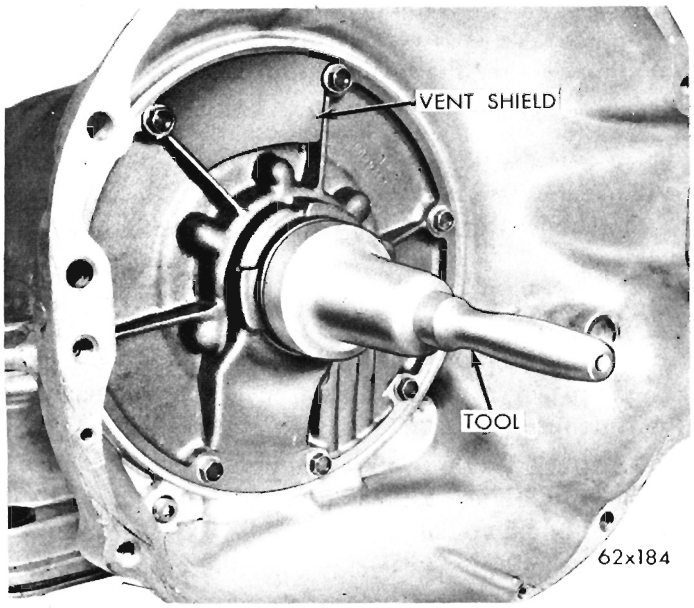


Fig. 55—Installing Front Pump Oil Seal

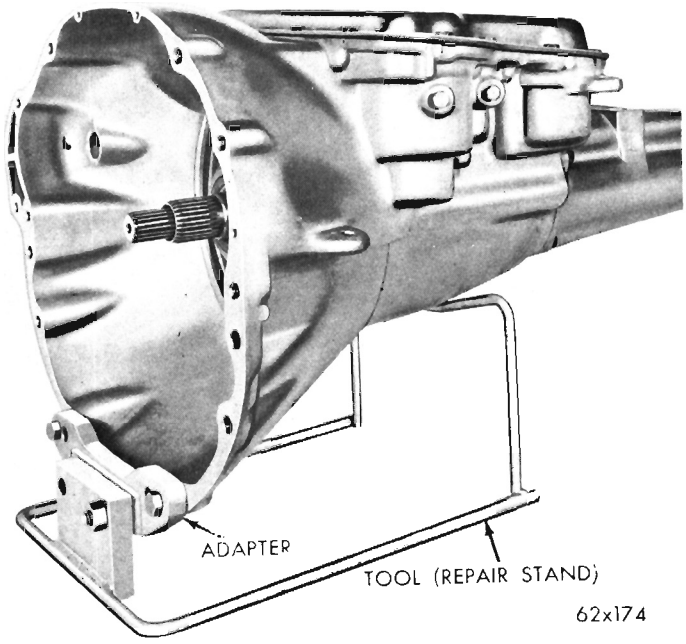


Fig. 56—Transmission Installed in Repair Stand

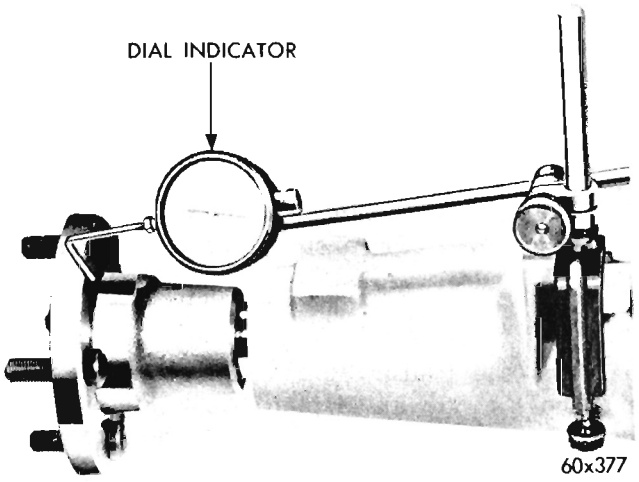


Fig. 57—Measuring Drive Train End Play (Six Cyl. Cars)

Measuring Drive Train End Play

Measure the drive train end play before removal of the output shaft universal joint flange. This will usually indicate when a change in the thrust washer is required to properly adjust end play during assembly (except when major parts are replaced). **The thrust washer is located between the reaction shaft support and the front clutch retainer on Eight Cylinder vehicles. The thrust washer is located between the input and output shafts on Six Cylinder Vehicles.**

(1) **Six Cylinder Vehicles:** Attach a dial indicator to the extension housing with its plunger seated against the companion flange (Fig. 57). **Chuck** the output shaft in and out to obtain end play reading. End play specifications are .024 to .069 inch.

Eight Cylinder Vehicles: Attach a dial indicator to the transmission bell housing with its plunger seated against the end of the input shaft (Fig. 58). Chuck the input shaft in and out to obtain end play reading. End play specifications are .030 to .069 inch.

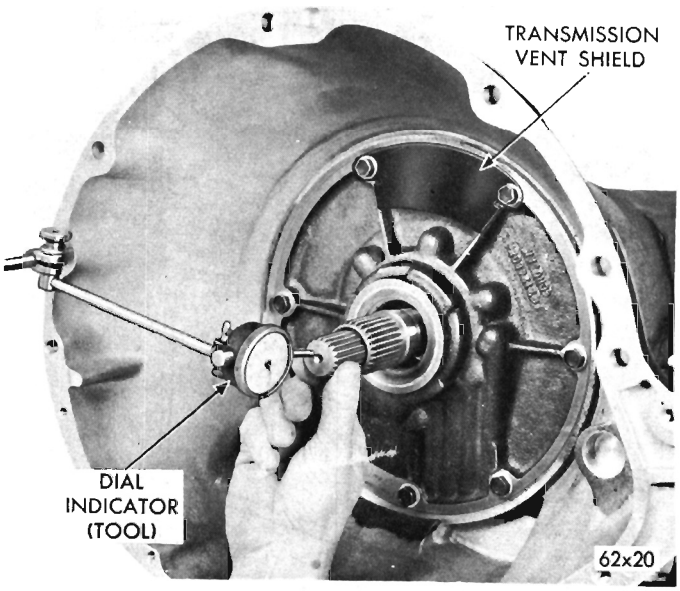


Fig. 58—Measuring Drive Train End Play (Eight Cyl. Cars)

(2) Record the indicator reading for reference when reassembling the transmission (Refer to Paragraph 49).

Extension Housing

(1) Hold the transmission flange with Tool C-3281, and remove the retaining nut and washer (Fig. 36). Slide the flange off the output shaft (Use puller, Tool C-452 if necessary).

(2) Remove the extension housing to transmission bolts, tap the housing lightly with a soft mallet to break it loose from the transmission, then carefully remove the housing.

Governor and Support

(1) Using a screw driver, carefully pry the snap ring from the weight end of the governor valve shaft (Fig. 43). Slide the valve and shaft assembly out of the governor body.

(2) Remove the snap ring from behind the governor body, then slide the governor body and support assembly off the output shaft.

Rear Oil Pump

(1) Unscrew the rear oil pump cover retaining bolts and remove the cover.

(2) The oil pump inner rotor is keyed to the output shaft by a small ball. Use care in sliding out the inner rotor so as not to lose the ball (Fig. 45). Remove the outer rotor from the pump body.

NOTE: If replacement of the rear oil pump body is required, drive it rearward out of the case with a wood block after the transmission has been disassembled.

Front Oil Pump and Reaction Shaft Support

(1) Remove the front oil pump housing retaining bolts.

(2) Tighten the front band adjusting screw until the band is tight on the front clutch retainer. This prevents the clutch retainer from coming out with the pump which might cause unnecessary damage to the clutches.

(3) Attach Tool C-3752 to the pump housing flange, as shown in Figure 59, install the tool in the threaded holes in the pump flange.

(4) Bump outward evenly on the two "knocker weights" to withdraw the oil pump and reaction shaft support assembly from the case.

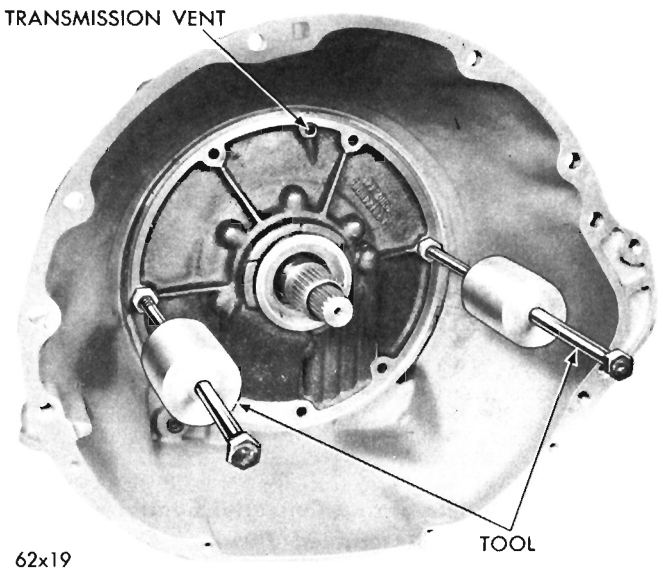


Fig. 59—Removing Front Oil Pump and Reaction Shaft Support Assembly

Front Band and Front Clutch

(1) Loosen the front band adjuster, remove the band strut and slide the band out of the case.

(2) Slide the front clutch assembly out of the case.

Input Shaft and Rear Clutch

(1) Grasp the input shaft, and slide the input shaft and rear clutch assembly out of the case.

NOTE: Be careful not to lose the thrust washer located between the rear end of input shaft and forward end of the output shaft.

Planetary Gear ssemblies, Sun Gear, Driving Shell

(1) While supporting the output shaft and driving shell, carefully slide the assembly forward and out through the case.

NOTE: Be very careful not to damage the ground surfaces on the output shaft during removal.

Rear Band and Low-Reverse Drum

(1) Remove the low-reverse drum, then loosen the rear band adjuster, remove the band strut and remove the band from the case.

Overrunning Clutch

(1) Note the position of the overrunning clutch rollers and spring before disassembly to assist in reassembly.

(2) Carefully slide out the clutch hub and remove the rollers and springs. Remove the low and reverse drum thrust washer (Six Cylinder Vehicle) from inside the overrunning clutch case.

NOTE: If the overrunning clutch cam and/or roller spring retainer are found damaged or worn, refer to Paragraph 46 for replacement procedures.

Kickdown Servo

(1) Compress the kickdown servo spring by using engine valve spring compressor, Tool C-3422, then remove the snap ring (Fig. 60).

(2) Remove the rod guide, springs and piston rod from the case. Be careful not to damage the piston rod or guide during removal.

(3) Insert Tool C-484 inside the piston and withdraw the piston from the transmission case.

Low and Reverse Servo

(1) Compress the low and reverse servo piston spring by using engine valve spring compressor, Tool C-3422, then remove the snap ring.

(2) Remove the spring retainer, spring, and servo piston and plug assembly from the case.

30. RECONDITION SUB-ASSEMBLIES

The following procedures cover the disassembly, inspection, repair, and assembly of each sub-assembly as removed from the transmission.

Pre-sized service bushings are available for replacement for most all bushings in the TorqueFlite transmission. The two bushings in the sun gear are not serviced because of the low cost of the sun gear assembly. If the bushings are found worn or scored, they should be replaced as outlined in the following

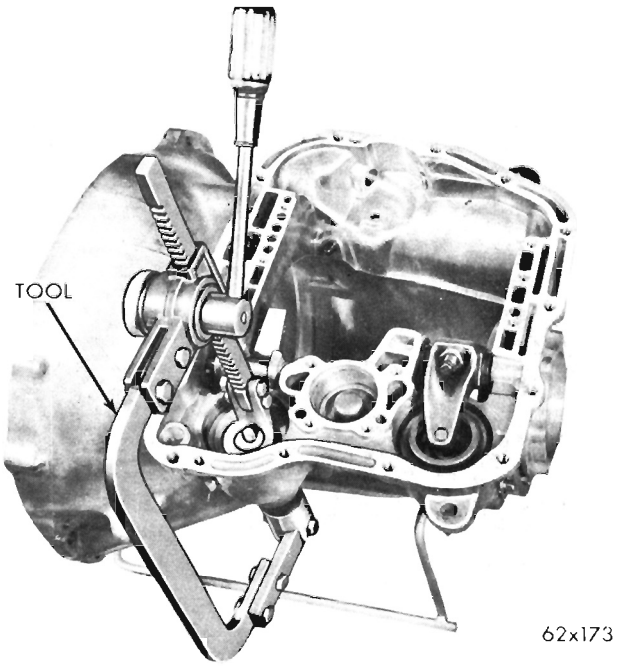


Fig. 60—Compressing Kickdown Servo Spring

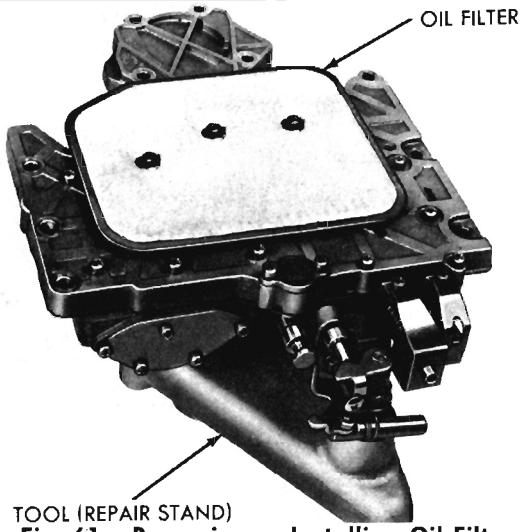


Fig. 61—Removing or Installing Oil Filter

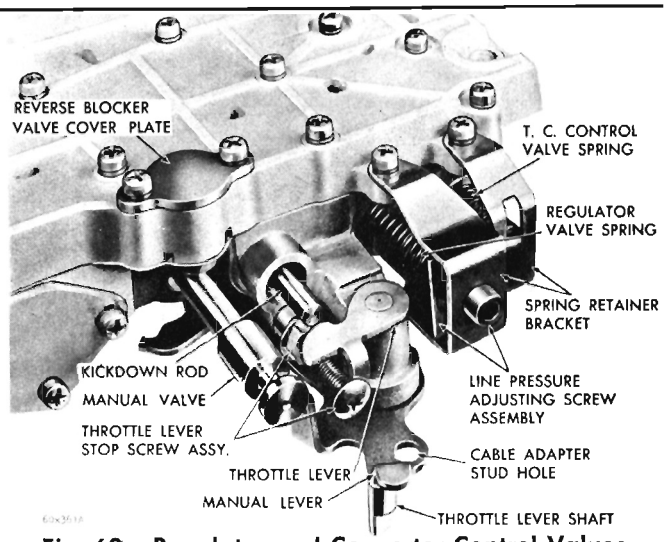


Fig. 62—Regulator and Converter Control Valves (Assembled View)

reconditioning procedures.

The bushing replacement tools listed by "SP" numbers are part of Tool Kit C-3887.

The use of crocus cloth is permissible where necessary, providing it is used carefully. When used on the valves, use extreme care to avoid rounding off the sharp edges. The sharp edge is vitally important to this type valve. Sharp edges prevent dirt and foreign matter from getting between the valve and body, thus reducing the posssibilities of sticking. When it becomes necessary to recondition the transmission, and the vehicle has accumulated considerable mileage, install new seal rings on parts requiring their usage.

NOTE: Coat each part with Automatic Transmission Fluid Type "A" Suffix "A" during assembly.

31. VALVE BODY ASSEMBLY

Disassembly

CAUTION: Never clamp any portion of the valve body or transfer plate in a vise. Any slight distortion of the aluminum body or the transfer plate will result in sticking valves, excessive leakage or both. When removing or installing valves or plugs, slide them in or out carefully. Do not use force.

(1) Place the valve body assembly on repair stand, Tool C-3749 (Fig. 61). Remove three screws from the oil filter and lift off the filter and gasket.

(2) While holding the spring retainer bracket firmly against the spring force, remove the three bracket retaining screws (Fig. 62).

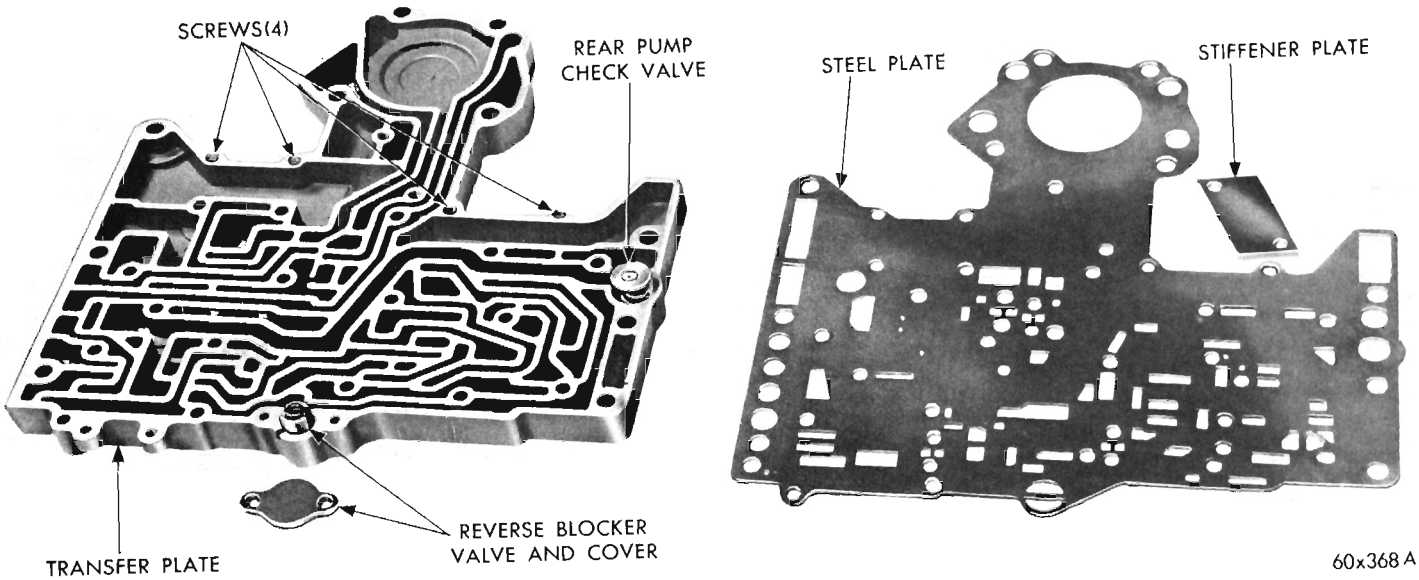


Fig. 63—Transfer and Steel Separator Plate Assembly (Disassembled)

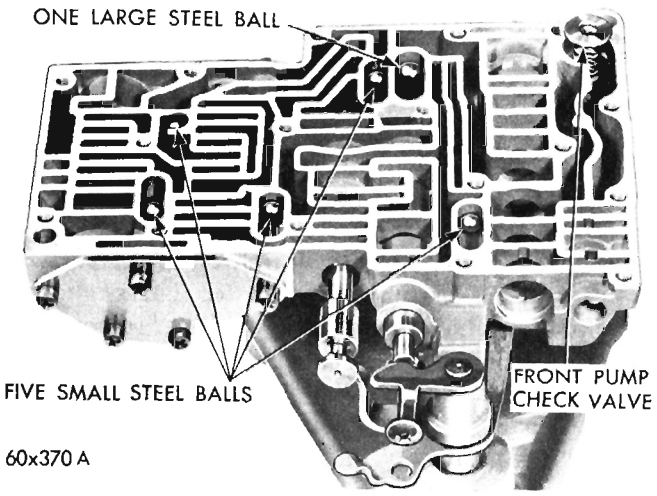


Fig. 64—Front Pump Check Valve and Steel Ball Location

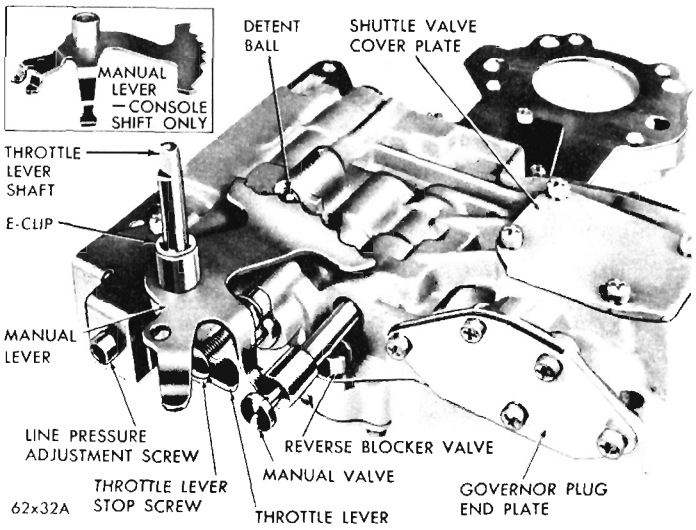


Fig. 65—Valve Body Controls (Assembled View)

(3) Remove the spring bracket, torque converter control valve spring, and the regulator valve spring with line pressure adjusting screw assembly.

NOTE: Do not alter the setting of the line pressure adjusting screw and nut. The nut has an interference thread and does not turn easily on the screw.

(4) Slide the regulator valve out of the valve body. Slide the torque converter control valve out of the valve body.

(5) Remove the 14 transfer plate retaining screws. Carefully lift the transfer plate and steel plate assembly off the valve body.

(6) Invert the transfer plate assembly and remove the stiffener plate. Remove remaining screws securing the steel plate to transfer plate, and carefully lift off the steel plate (Fig. 63). Remove the rear pump check valve and spring.

(7) Remove the reverse blocker valve cover and lift out the spring and valve.

(8) Note location of the six steel balls in the valve body, one is larger than the other five and is in the larger chamber (Fig 64). Remove the steel balls, front pump check valve and spring.

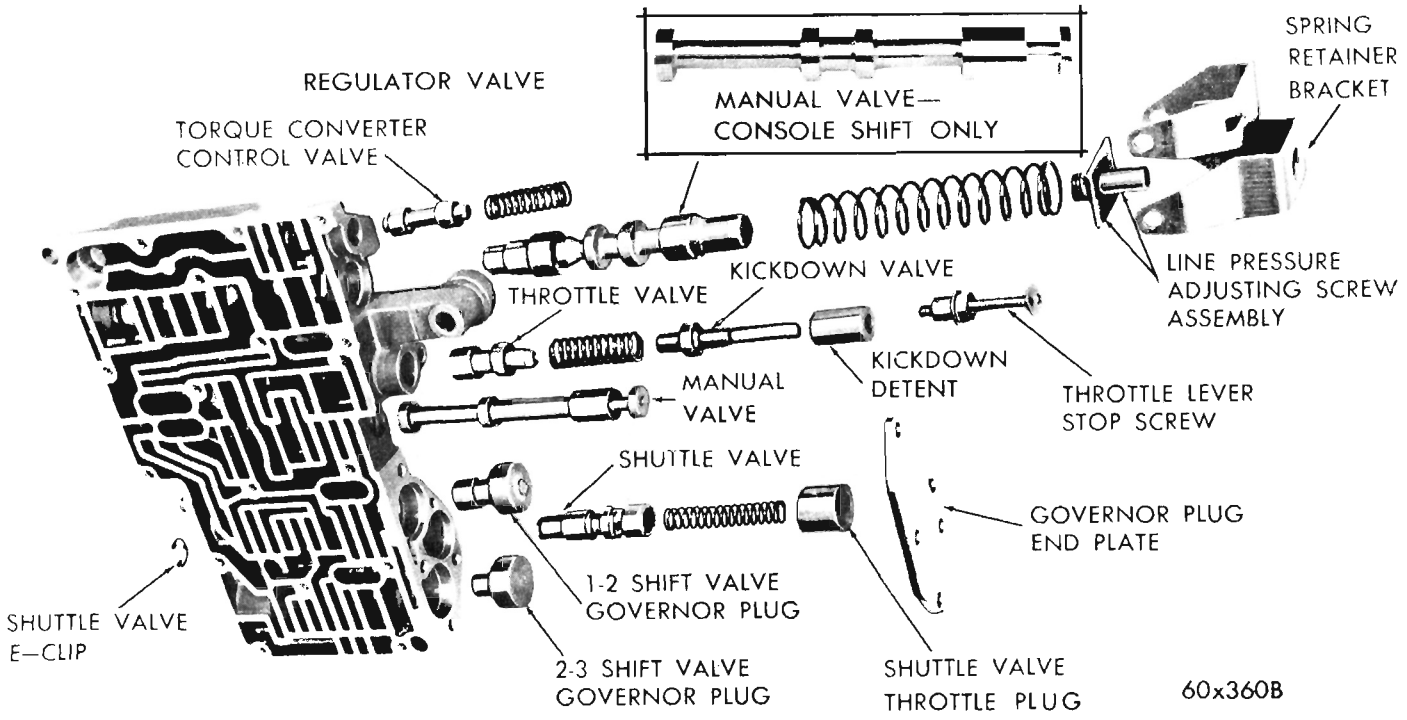


Fig. 66—Valve Body—Lever Side (Disassembled)

(9) Invert the valve body and lay it on a clean cloth or paper. Remove E-clip from the throttle lever shaft (Fig. 65). Remove any burrs from the shaft, then while holding the manual lever detent ball and spring in their bore with Tool C-3765 or similar tool, slide the manual lever off the throttle shaft. Remove the detent ball and spring.

(10) Remove the manual valve, carefully slide it out of valve body with a rotating motion.

(11) Remove the throttle lever and shaft from the valve body.

(12) Remove the shuttle valve cover plate (Fig. 65). Remove the E-clip from the exposed end of the shuttle valve.

(13) Remove the throttle lever stop screw assembly (Fig. 66), be careful not to disturb the setting any more than is necessary.

(14) Remove the kickdown detent, kickdown valve, throttle valve spring and the throttle valve (Fig. 66).

(15) Remove the governor plug end plate (Fig. 66). Tip up the valve body to allow the shuttle valve throttle plug, spring, shuttle valve, and the shift valve governor plugs to slide out into your hand.

Note the longer stem on the 1-2 shift valve plug as a means for identification.

(16) Remove the shift valve end plate (Fig. 67) and slide out the two springs and valves.

(17) Remove the regulator valve end plate. Slide the regulator valve line pressure plug, sleeve, and the regulator valve throttle pressure plug out of the valve body.

Cleaning and Inspection

Allow all parts to soak a few minutes in a suitable clean solvent. Wash thoroughly and blow dry with compressed air. Make sure all the passages are clean and free from obstructions.

Inspect the manual and throttle valve operating levers and shafts for being bent, worn or loose. If a lever is loose on its shaft, it may be **silver soldered** only, or the lever and shaft assembly should be replaced. **Do not attempt to straighten bent levers.**

Inspect all mating surfaces for burrs, nicks and scratches. Minor blemishes may be removed with crocus cloth, using only a very light pressure. Using a straight edge, Tool C-3335, inspect all mating surfaces for warpage or distortion. Slight distortion may be corrected, using a surface plate. Make sure all metering holes in the steel plate are open. Using a pen light, inspect bores in the valve body for scores, scratches, pits and irregularities.

Inspect all valve springs for distortion and collapsed coils. Inspect all valves and plugs for burrs, nicks and scores. Small nicks and scores may be removed with crocus cloth, providing extreme care is taken not to round off the sharp edges. The sharpness of these edges is vitally important because it prevents foreign matter from lodging between the valve and the valve body, thus reducing the possibility of sticking. Inspect all valves and plugs for freedom of operation in the valve body bores. When bores, valves and plugs are clean and dry, the valves and plugs should fall freely in the bores.

NOTE: The valve body bores do not change dimensionally with use. Therefore, a valve body that was functioning properly when the vehicle was new, will operate correctly if it is properly and thoroughly cleaned. There is no need to replace the valve body unless it is damaged in handling.

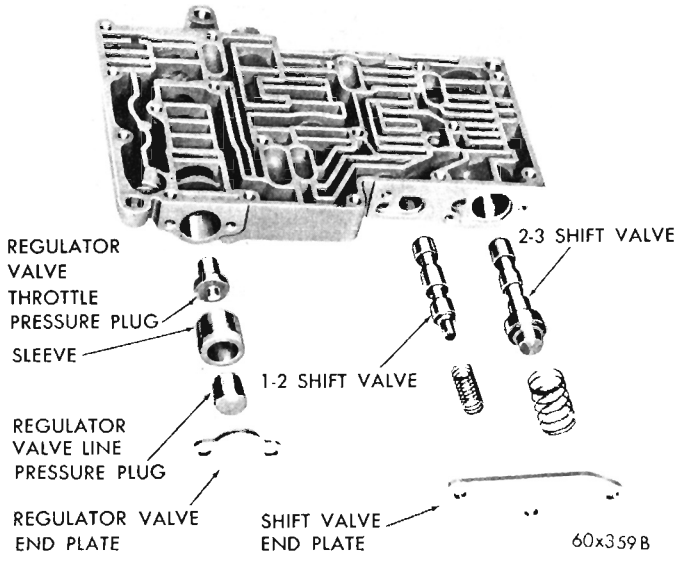


Fig. 67—Valve Body—Shift Valve Side (Disassembled)

Assembly

(1) Place the rear pump check valve and spring in the transfer plate (Fig. 63). Position the steel plate on the transfer plate, hold the rear pump check valve in its bore with a thin steel scale, and install four steel plate to transfer plate retaining screws. Make sure the bolt holes in the steel plate and transfer plate are aligned, then tighten screws evenly to 28 inch-pounds torque. Inspect the rear pump check valve for free movement in the transfer plate. Install the stiffener plate and tighten the retaining screws to 28 inch-pounds torque.

(2) Turn the transfer plate over and install the reverse blocker valve spring and valve (Fig. 63). Rotate the valve until it seats through the steel plate. Hold the valve down and install the blocker valve cover plate. Tighten the two remaining screws to 28 inch-pounds torque.

(3) Place the 1-2 and 2-3 shift valve governor plugs in their respective bores (Fig. 66). Install the shuttle valve, spring and shuttle valve throttle plug. Install the governor plug end plate and tighten the five retaining screws to 28 inch-pounds torque.

(4) Install E-clip on end of the shuttle valve (Fig. 66). Install the shuttle valve cover plate and tighten the four retaining screws to 28 inch-pounds torque.

(5) Install the 1-2 and 2-3 shift valves and springs (Fig. 67). Install the shift valve end plate and tighten the three retaining screws to 28 inch-pounds torque.

(6) Install the regulator valve throttle pressure plug, sleeve, and the line pressure plug (Fig. 67). Install the regulator valve end plate and tighten the two retaining screws to 28 inch-pounds torque.

(7) Install the throttle valve and spring (Fig. 66). Slide the kickdown detent and the kickdown valve (counterbore side of detent toward valve), then install the assembly in the valve body.

(8) Install the throttle lever stop screw (Fig. 66), and tighten the lock nut finger tight.

(9) Install the manual valve in the valve body (Fig. 66).

NOTE: The insert in Figure 66 shows the manual valve used in transmissions with the console shift.

(10) Install the throttle lever and shaft on the valve body (Fig. 68). Insert the detent spring and ball in its bore in the valve body. Depress the ball and spring with Tool C-3765 or similar tool and slide the manual lever over the throttle shaft so that it engages the manual valve and detent ball. Install the retaining E-clip on the throttle shaft.

NOTE: The insert in Figure 65 shows the manual lever used in transmissions with the console shift.

(11) Position the valve body assembly on the holding stand.

(12) Place the six steel balls in the valve body chambers with the large ball in the large chamber (Fig. 64). Place the front pump check valve and spring in the valve body.

(13) Position the transfer plate assembly on the valve body. Hold the front pump check valve in its bore with a thin steel scale. Install the 14 retaining screws, starting at the center and working outward, tighten the screws to 28 inch-pounds torque.

(14) Install the torque converter valve and the regulator valve (Fig. 66).

(15) Position the torque converter valve spring and regulator valve spring over the ends of their respective valves. Place the line pressure adjusting screw assembly on the end of the regulator valve spring with

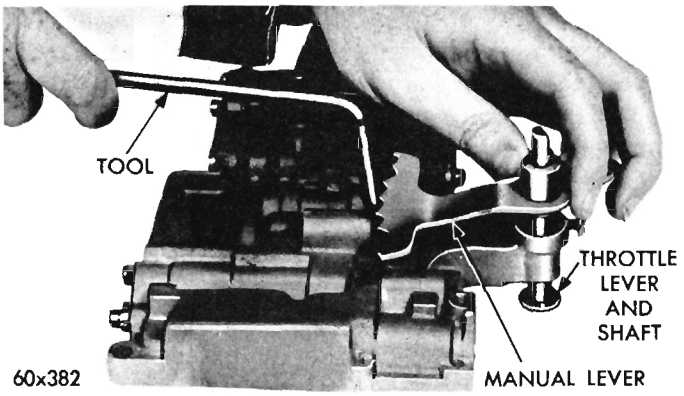


Fig. 68—Installing Detent Ball, Spring and Manual Lever

long dimension of nut at right angles to the valve body (Fig. 62).

(16) Install the spring retainer bracket, making sure the converter valve spring is engaged on the tang and position squarely in the bracket. Tighten the three bracket retaining screws to 28 inch-pounds torque (Fig. 62).

NOTE: Measure and if necessary, align the spring retainer bracket, as described in Paragraph 15.

(17) Install the oil filter and tighten the three retaining screws to 28 inch-pounds torque. **After the valve body has been serviced and completely assembled, adjust the throttle and line pressures, as outlined in Paragraph 15. However, if pressures were satisfactory prior to disassembly, use the original settings.**

32. ACCUMULATOR PISTON AND SPRING

Inspection

Inspect the two seal rings for wear and make sure

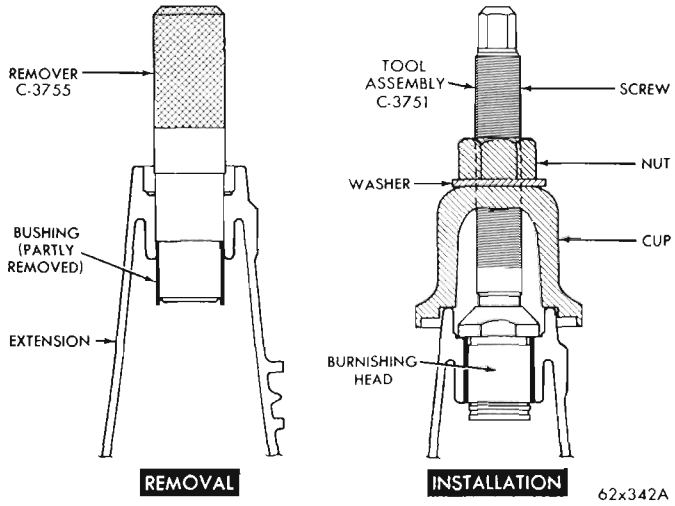


Fig. 69—Replacing Extension Housing Bushing (Six Cylinder Cars)

they turn freely in the piston grooves. It is not necessary to remove the rings unless conditions warrant. Inspect the piston for nicks, burrs, scores and wear. Inspect the piston bore in the case for scores or other damage. Inspect the piston spring for distortion. Replace parts as required.

33. EXTENSION HOUSING BUSHING AND OIL SEAL (Six Cylinder Vehicles)

Replacement

(1) Drive the oil seal out of the extension housing with a long blunt drift.

(2) Drive out the bushing with Tool C-3755 (Fig. 69).

(3) Slide a new bushing over the ground end of Tool C-3751, then drive the bushing into the housing with the tool (Fig. 69). Make sure the oil hole of the bushing aligns with the slot in the housing.

(4) While holding the screw from turning, tighten the tool nut to draw the burnisher through the bushing.

(5) Place a new oil seal in the opening of the extension housing (lip of seal facing inward). Using Tool C-3754, drive the seal into the housing until tool bottoms (Fig. 39).

34. EXTENSION HOUSING BEARING AND OIL SEAL (Eight Cylinder Vehicles)

Replacement

(1) Pry or drive the oil seal out of the extension housing with a long blunt drift. Be sure not to mar the oil seal surface in the extension housing.

(2) Remove the bearing snap ring from the extension housing.

(3) Drive the bearing rearward out of the extension housing with Tool C-3275 (Fig. 41).

(4) Place a new bearing in opening of the extension housing. Using Tool C-3204, drive the bearing into the housing (Fig. 42). Install the bearing retaining snap ring.

(5) Place a new oil seal in opening of the extension housing (lip of seal facing inward). Using Tool C-3837, drive the seal into housing until tool bottoms (Fig. 40).

35. PARKING SPRAG AND LEVER

Disassembly

(1) Remove the parking lock cable adapter cover the bottom of the extension housing.

(2) Remove the plug and slide the shaft out of the extension housing to remove the parking lock lever, adapter and spacer (Fig. 47).

(3) Slide the bushing sleeve out of the housing to remove the parking sprag and spring (Fig. 48).

Inspection

Figure 70 shows the parking sprag and lever disassembled.

Inspect the bushing sleeve and shaft for scores and free movement in the housing, and in sprag and lever. Inspect the roller for nicks, burrs, and free turning. Inspect the square lug on parking sprag for broken edges or other damage. Replace parts as required.

Assembly

(1) Position the parking sprag and spring in the housing and insert the bushing sleeve (Fig. 48). Make sure the square lug on the sprag is toward the support gear and the spring is positioned so as to lift the sprag away from the gear.

(2) Position the lock lever, adapter and spacer in the housing and install the lever shaft (Fig. 47). The lever roller must be on top of the sprag so as to push it into engagement with the gear.

(3) Place a new adapter cover gasket on the extension housing, then insert a small punch through cable opening in the adapter cover and into the end of the adapter. Carefully lower the cover into position, feeding the adapter into the cable opening in the cover. Install the cover retaining screws and tighten to 150 inch-pounds torque.

36. GOVERNOR AND SUPPORT

Disassembly

(1) Remove the large snap ring from the weight end of the governor body, lift out the weight assembly.

(2) Remove the snap ring from inside the governor weight, remove the inner weight and spring from the outer weight.

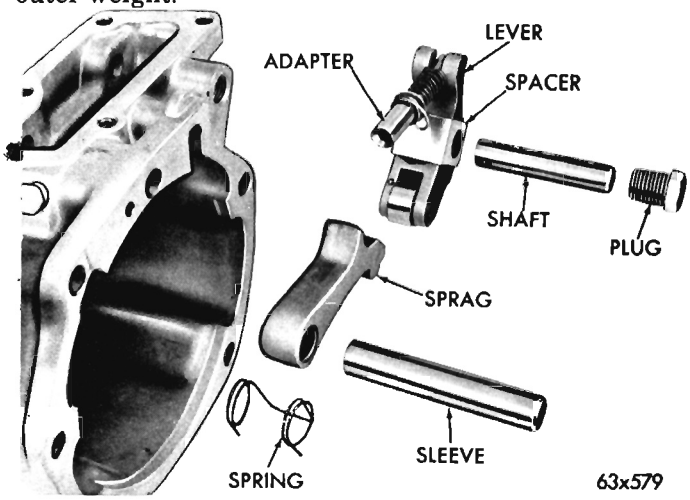


Fig. 70—Parking Lock Lever, Sprag and Cable Adapter (Disassembled)

(3) If the lugs on the support gear are damaged, remove the four bolts and separate the support from the governor body.

Cleaning and Inspection

Figure 44 shows a disassembled view of the governor assembly.

Inspect all parts for burrs and wear. Inspect the inner weight for free movement in the outer weight, and outer weight for free movement in the governor body. Inspect the valve for free movement in the governor body. The weights and valve should fall freely in the bores when clean and dry. Rough surfaces may be removed with crocus cloth.

Inspect the governor weight spring for distortion. Inspect the lugs on the parking sprag and support gear for broken edges or other damage. Thoroughly clean all the governor parts in clean solvent and test for free movement before assembly.

Assembly

(1) If the support was separated from the governor body, assemble and tighten the bolts finger tight. Make sure the oil passage of the governor body aligns with the passage in the support.

(2) Assemble the governor weights and spring, and secure with the snap ring inside of the large governor weight. Place the weight assembly in the governor body and install the snap ring.

37. REAR OIL PUMP

Inspection

Inspect the oil pump body and cover machined surfaces for nicks and burrs. Inspect the rotors for scoring or pitting. With the rotors cleaned and installed in the pump body, place a straight edge across the face of rotors and pump body. Use a feeler gauge to measure the clearance between the straight edge and face of the rotors. Clearance limits are from .0015 to .003 inch.

Rear Oil Pump Body Replacement

If replacement of the rear oil pump body is required, drive it rearward out of the case with a wood block and hammer. The following procedures must be followed when installing a new rear oil pump body or reinstalling the original pump body to prevent pump body distortion.

(1) Screw two pilot studs, Tool C-3288 into the case to guide the pump body during installation.

(2) Chill the pump body in cold water or with ice. Quickly position the body over the pilot studs, and drive it firmly into the case with a wood block and hammer. Remove the pilot studs.

38. FRONT OIL PUMP AND REACTION SHAFT SUPPORT (Six Cylinder Cars)

Disassembly

Figure 71 shows the front oil pump and reaction shaft support disassembled.

(1) Remove the bolts from the rear side of the reaction shaft support and lift the support off the oil pump.

(2) Remove the rubber seal ring from the front pump body flange.

(3) Drive out the oil seal with a blunt punch.

Inspection

Inspect interlocking seal rings (Fig. 71) on the reaction shaft support for wear or broken locks, make sure they turn freely in the grooves. Do not remove rings unless conditions warrant. Inspect the front clutch piston retainer to reaction shaft support thrust washer for wear. Washer thickness should be .043 to

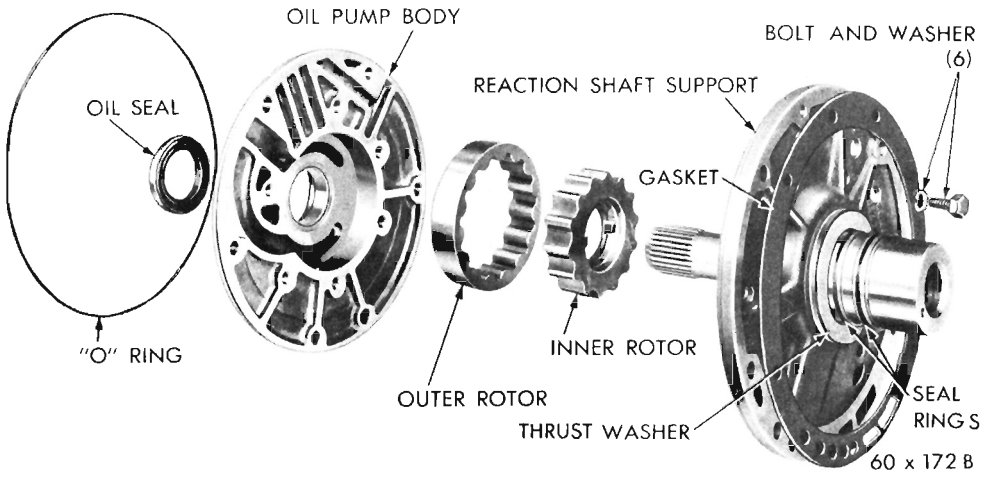


Fig. 71—Front Oil Pump and Reaction Shaft Support (Six Cylinder Cars)

.045 inch, replace if necessary. Inspect machined surfaces on the oil pump body and reaction shaft support for nicks and burrs. Inspect the pump body and reaction shaft support bushings for wear or scores. Inspect the oil pump rotors for scoring or pitting. With the rotors cleaned and installed in the pump body, place a straight edge across face of the rotors and pump body. Use a feeler gauge to measure the clearance between the straight edge and face of the rotors. Clearance limits are from .001 to .0025 inch. Also, with a feeler gauge, measure the rotor tip clearance between the inner and outer rotor teeth. Clearance limits are from .007 to .012 inch.

Front Pump Bushing Replacement

(1) Place the front pump housing (seal face down) on a smooth firm surface.

(2) Place the removing head, Tool SP-3551 in the bushing and install the handle, Tool SP-3549 in the removing head (Fig. 72).

(3) Drive the bushing straight down and out of the pump housing bore. Be careful not to cock the tool in the bore.

(4) Position the new bushing on the installing head, Tool SP-3624.

(5) With the pump housing on a smooth clean surface, start the bushing and installing head in the bushing bore. Install the handle, Tool SP-3549 in the installing head (Fig. 72).

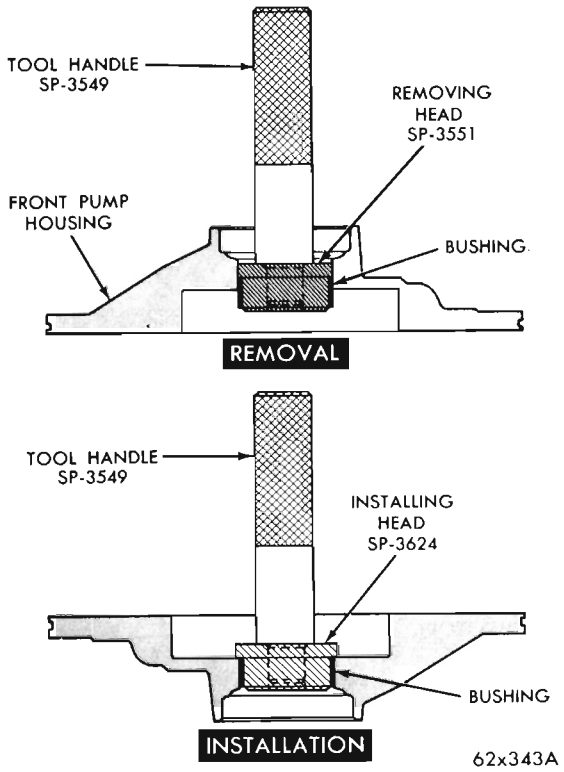


Fig. 72—Replacing Front Pump Bushing (Six Cyl. Cars)

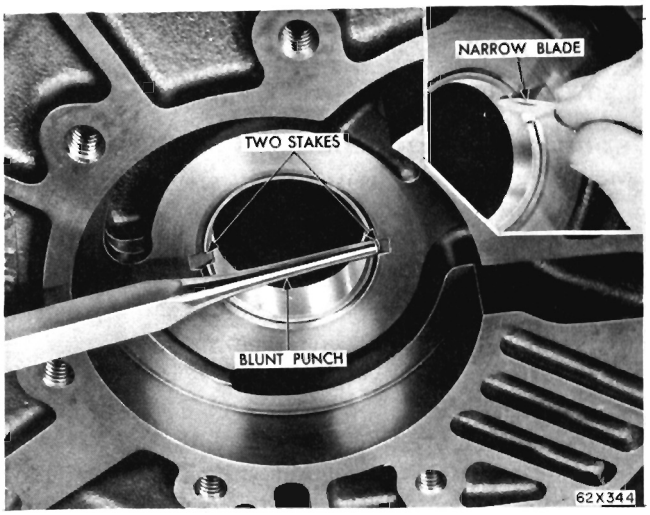


Fig. 73—Staking Front Pump Bushing (Six Cyl. Cars)

(6) Drive the bushing into the housing until the tool bottoms in the pump cavity. Be careful not to cock the tool during installation.

(7) Stake the bushing in place by using a blunt punch or similar tool (Fig. 73). A gently tap at each stake slot location will suffice.

(8) Using a narrow-bladed knife or similar tool, remove the high points or burrs around the staked area (Fig. 73). Do not use a file or similar tool that will remove more metal than is necessary.

Reaction Shaft Bushing Replacement

In case of a reaction shaft bushing failure, always inspect the support for wear from the input shaft seal ring lands. If worn or grooved, replace the support assembly.

(1) Assemble the remover Tool SP-3631, the cup Tool SP-3633, and the hex nut Tool SP-1191.

CAUTION: Do not clamp any part of the reaction shaft or support in a vise.

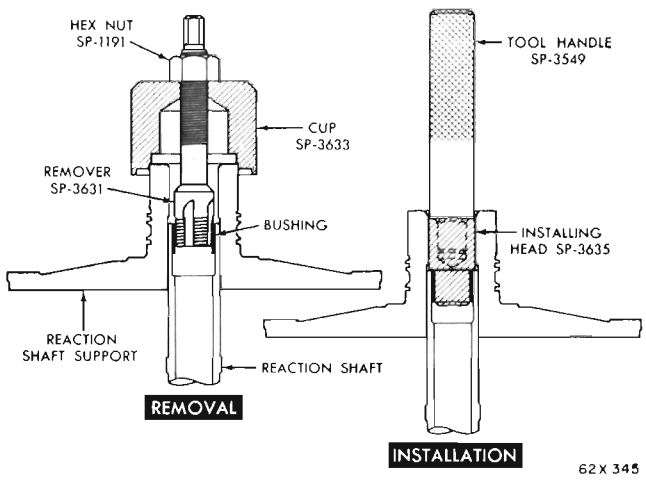


Fig. 74—Replacing Reaction Shaft Bushing (Six Cyl. Cars)

(2) With the cup held firmly against the reaction shaft, thread the remover into the bushing as far as possible by hand (Fig. 74).

(3) Using a wrench, screw the remover into the bushing 3 to 4 additional turns to firmly engage the threads in the bushing.

(4) Turn the hex nut down against the cup to pull the bushing from the reaction shaft. Thoroughly clean the reaction shaft to remove the chips made by the remover threads.

(5) Lightly grip the bushing in a vise or with pliers and back the tool out of the bushing. Be careful not to damage the threads on the bushing remover.

(6) Slide a new bushing on the installing head Tool SP-3635, and start them in the bore of the reaction shaft.

(7) Support the reaction shaft upright on a clean smooth surface and install the handle Tool SP-3549 in the installing head (Fig. 74). Drive the bushing into the shaft until the tool bottoms.

(8) Thoroughly clean the reaction shaft support assembly before installation.

Assembly

(1) Place the reaction shaft support in assembling Tool C-3759 with hub of the support resting on a bench (Fig. 75). Screw two pilot studs, Tool C-3283 into threaded holes of the reaction shaft support flange.

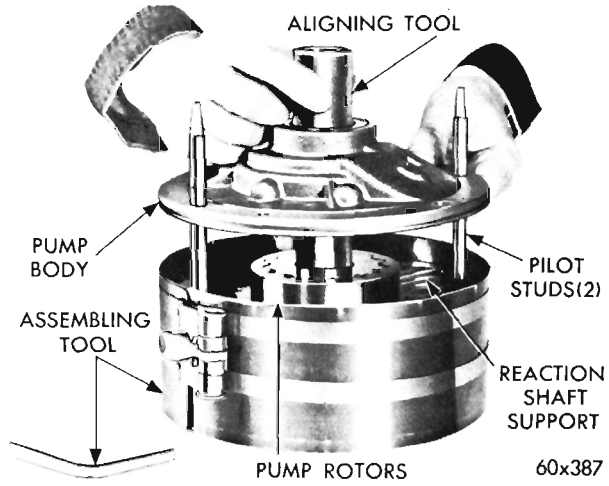


Fig. 75—Assembling Front Pump and Reaction Shaft Support (Six Cylinder Cars)

(2) Assemble and place the rotors in center of the support (Fig. 75).

(3) Lower the pump body over the pilot studs, insert Tool C-3756 through the pump body and engage with the pump inner rotor. Rotate the rotors with the tool to enter the rotors in the pump body, then with the pump body firmly against the reaction shaft support, tighten the clamping tool securely.

(4) Invert the front pump and reaction shaft support assembly with the clamping tool intact. Install the support to pump body bolts and tighten to 125 inch-pounds torque. Remove the clamping tool, pilot

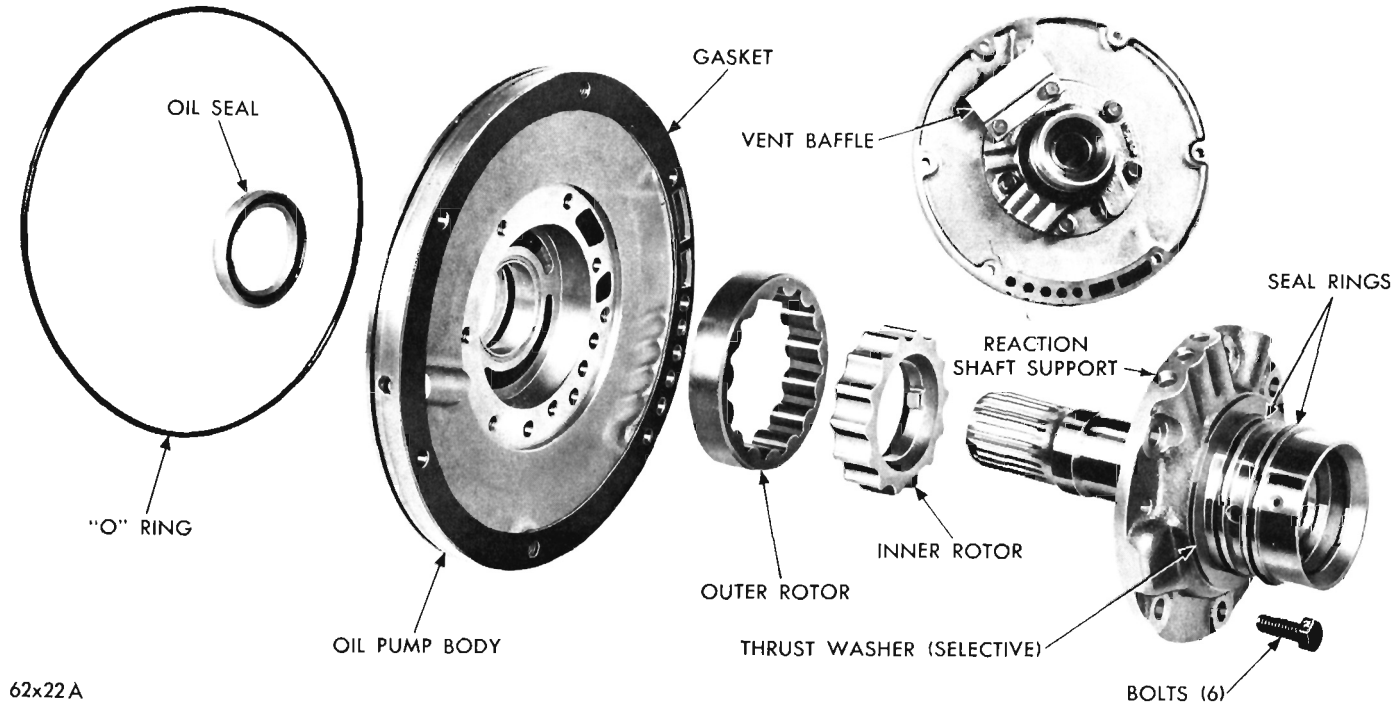


Fig. 76—Front Oil Pump and Reaction Shaft Support (Eight Cylinder Cars)

studs and the rotor alignment tool.

(5) Place a new oil seal in opening of the front oil pump housing (lip of seal facing inward). Using Tool C-3757, drive the seal into the housing until tool bottoms.

39. FRONT OIL PUMP AND REACTION SHAFT SUPPORT (Eight Cylinder Vehicles)

Disassembly

Figure 76 shows the front oil pump and reaction shaft support disassembled.

(1) Remove the bolts from the rear side of the reaction shaft support, and remove the vent baffle and lift the support off the oil pump.

(2) Remove the rubber seal ring from the front pump body flange.

(3) Drive out the oil seal with a blunt punch.

Inspection

Inspect the interlocking seal rings (Fig. 76) on the reaction shaft support for wear or broken locks, make sure they turn freely in the grooves. Do not remove the rings unless conditions warrant. Inspect the machined surfaces on the oil pump body and reaction shaft support for nicks and burrs. Inspect the pump body and reaction shaft support bushings for wear or scores. Inspect the oil pump rotors for scoring or pitting. With the rotors cleaned and installed in the pump body, place a straight edge across the face of the rotors and the pump body. Use a feeler gauge to measure the clearance between straight edge and face of the rotors. Clearance limits are from .001 to .0025 inch. Also, with a feeler gauge, measure the rotor tip clearance between the inner and outer rotor teeth. Clearance limits are from .007 to .012 inch.

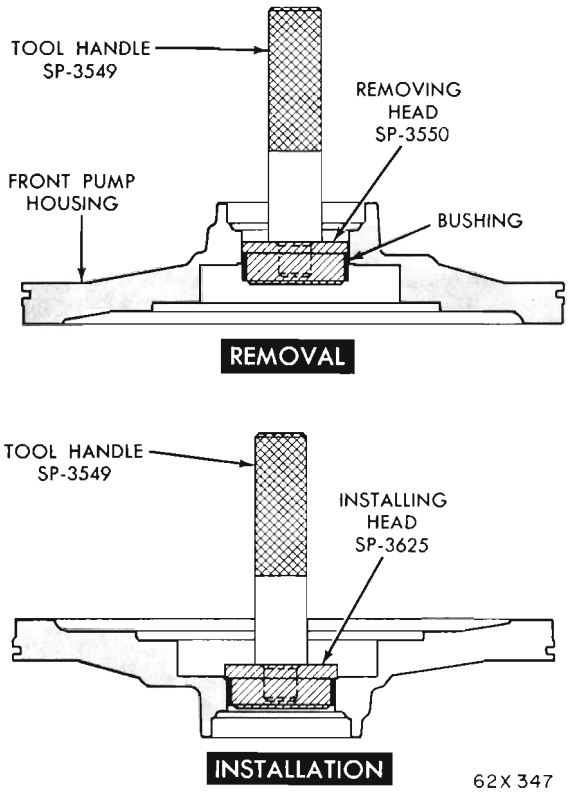


Fig. 77—Replacing Front Pump Bushing (Eight Cylinder Cars)

Front Pump Bushing Replacement

(1) Place the front pump housing on a clean smooth surface with the rotor cavity down.

(2) Place the removing head Tool SP-3550 in the bushing, and install the handle Tool SP-3549 in the removing head (Fig. 77).

(3) Drive the bushing straight down and out of the bore. Be careful not to cock the tool in the bore.

(4) Position a new bushing on the installing head Tool SP-3625.

(5) With the pump housing on a smooth clean surface (hub end down), start the bushing and installing head in the bushing bore. Install the handle Tool SP-3549 in the installing head (Fig. 77).

(6) Drive the bushing into the housing until the tool bottoms in the pump cavity. Be careful not to cock the tool during installation.

(7) Stake the bushing in place by using a blunt punch or similar tool (Fig. 78). A gentle tap at each stake slot location will suffice.

(8) Using a narrow-bladed knife or similar tool, remove the high points or burrs around the staked area (Fig. 78). Do not use a file or similar tool that will remove more metal than is necessary.

(9) Thoroughly clean the pump housing before installation.

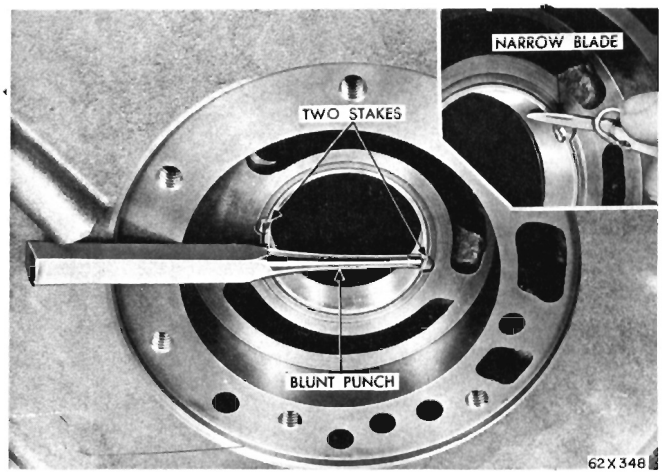


Fig. 78—Staking Front Pump Bushing (Eight Cyl. Cars)

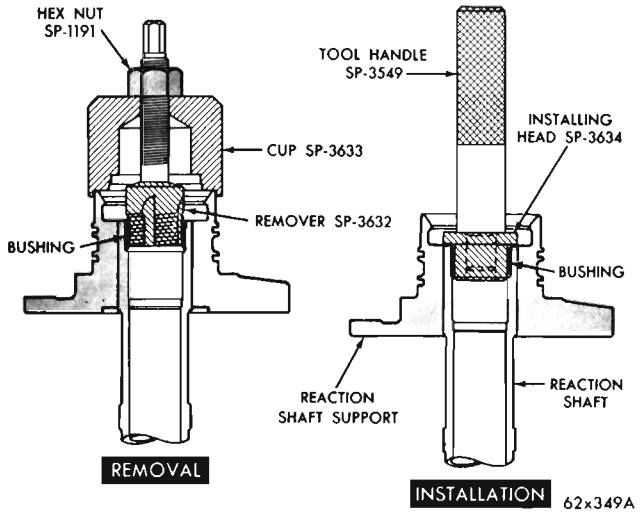


Fig. 79—Replacing Reaction Shaft Bushing (Eight Cylinder Cars)

Reaction Shaft Bushing Replacement

(1) Assemble the remover Tool SP-3632, the cup Tool SP-3633, and the hex nut Tool SP-1191.

CAUTION: Do not clamp any part of the reaction shaft or support in a vise.

(2) With the cup held firmly against the reaction shaft, thread the remover into the bushing as far as possible by hand (Fig. 79).

(3) Use a wrench to screw the remover into the bushing 3 to 4 additional turns to firmly engage the threads in the bushings.

(4) Turn the hex nut down against the cup to pull the bushing from the reaction shaft. Thoroughly clean the reaction shaft to remove the chips made by the remover threads.

(5) Lightly grip the bushing in a vise or with pliers and back the tool out of the bushing. Be careful not to damage the threads on the bushing remover.

(6) Slide a new bushing (chamfered end first) on the installing head Tool SP-3634, and start them in the bore of the reaction shaft.

(7) Support the reaction shaft upright on a clean smooth surface and install handle Tool SP-3549 in the installing head (Fig. 79). Drive the bushing into the shaft until the tool bottoms.

(8) Thoroughly clean the reaction shaft support assembly before installation.

Assembly

(1) Assemble the pump rotors in the pump housing (Fig. 76).

(2) Install the reaction shaft support and position the vent baffle over the vent opening. Install the retaining bolts and tighten to 150 inch-pounds torque.

(3) Place a new oil seal in opening of the front oil pump housing (lip of seal facing inward) using Tool C-3860 drive the seal into the housing until the tool bottoms.

40. FRONT CLUTCH (Six Cylinder Vehicles)

Disassembly

Figure 80 shows a disassembled view of the front clutch assembly.

(1) Use a screw driver to remove the large snap ring that secures the pressure plate in the clutch piston retainer. Lift the pressure plate and clutch plates out of the retainer.

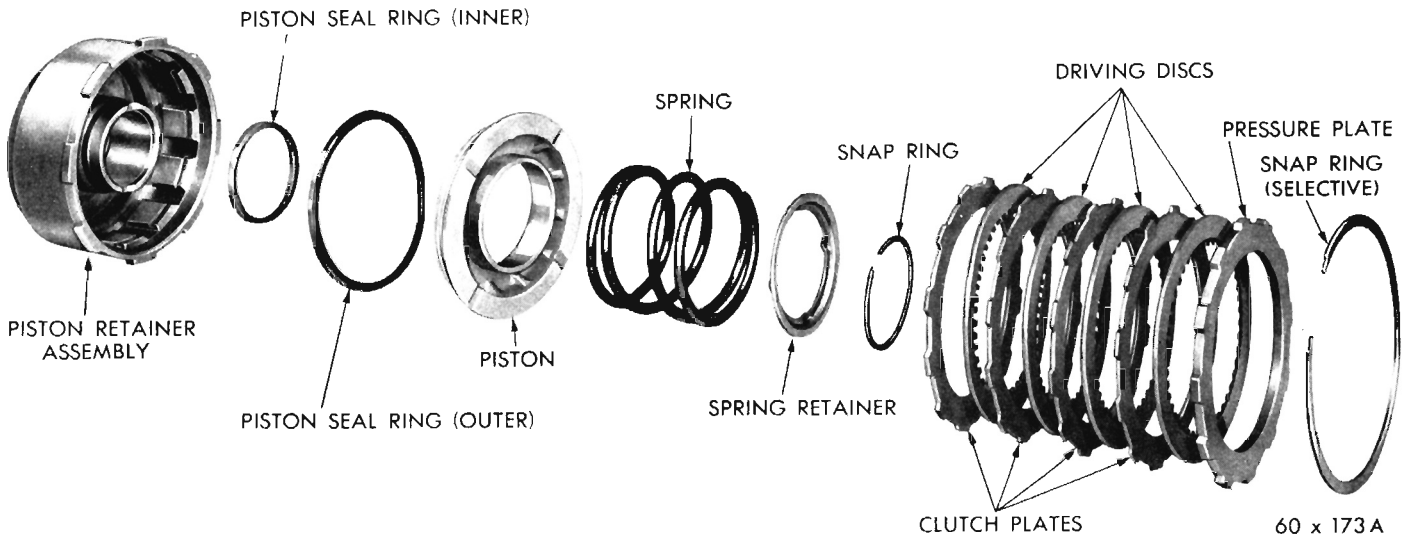


Fig. 80—Front Clutch Assembly—Disassembled (Six Cylinder Cars)

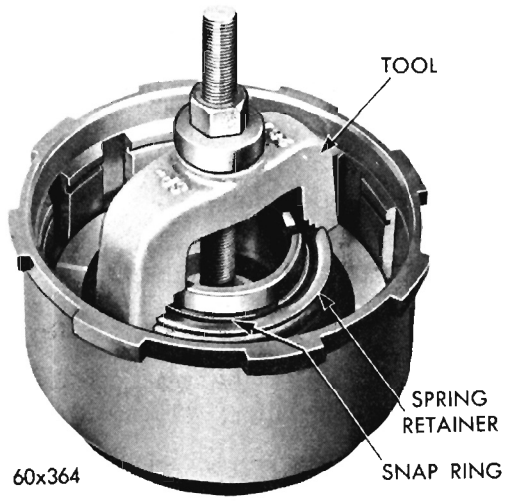


Fig. 81—Removing or Installing Front Clutch Retainer Snap Ring (Six Cylinder Cars)

(2) Install compressor, Tool C-3575 over the piston spring retainer, as shown in Figure 81. Compress the spring and remove the snap ring, then slowly release the tool until the spring retainer is free of the hub. Remove the tool, retainer and spring.

(3) Invert the clutch retainer assembly and bump it on a wood block to remove the piston. Remove the seal rings from the piston and clutch retainer hub.

Inspection

Inspect the facing material on all the driving discs. Replace discs that are charred, glazed or heavily pitted. Discs should also be replaced if they show evidence of material flaking off or if the facing material can be scraped off easily. Inspect the driving disc splines for wear or other damage. Inspect the steel plate and pressure plate surfaces for burning, scoring or damaged driving lugs. Replace if necessary.

Inspect the steel plate lug grooves in the clutch retainer for smooth surfaces, plates must travel freely in grooves. Inspect the band contacting surface on the clutch retainer for scores, **the contact surface should be protected from damage during disassembly and handling**. Note the ball check in the clutch retainer, make sure the ball moves freely. Inspect the piston seal ring surfaces in the clutch retainer for nicks or deep scratches, light scratches will not interfere with the sealing of neoprene rings. Inspect the clutch retainer inner bore surface for wear from the reaction shaft support seal rings. Inspect the clutch retainer bushing for wear or scores.

Inspect the inside bore of the piston for score marks, if light, remove with crocus cloth. Inspect the seal ring grooves for nicks and burrs. Inspect the neoprene seal rings for deterioration, wear, and hardness. Inspect the piston spring, retainer and snap ring for distortion.

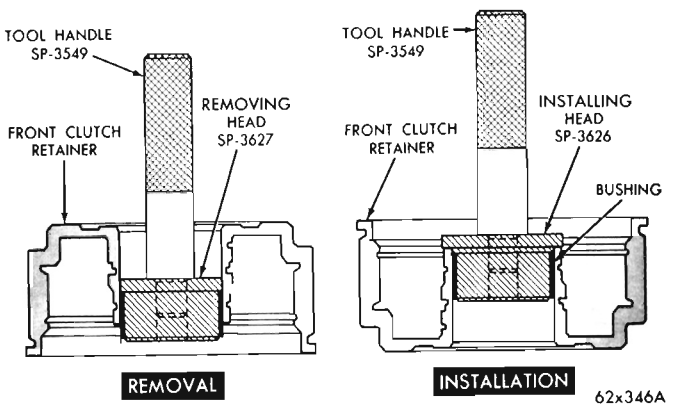


Fig. 82—Replacing Front Clutch Retainer Bushing (Six Cylinder Cars)

Front Clutch Retainer Bushing Replacement

(1) Lay the clutch retainer (open end down) on a clean smooth surface and place the removing head Tool SP-3627 in the bushing (Fig. 82). Install the handle Tool SP-3549 in the removing head.

(2) Drive the bushing straight down and out of the clutch retainer bore. Be careful not to cock the tool in the bore.

(3) Lay the clutch retainer (open end up) on a clean smooth surface. Slide a new bushing on the installing head Tool SP-3626, and start them in the clutch retainer bore (Fig. 82).

(4) Install handle Tool SP-3549 in the installing head. Drive the bushing into the clutch retainer until the tool bottoms.

(5) Thoroughly clean the clutch retainer before assembly and installation.

Assembly

(1) Lubricate and install the inner seal ring on

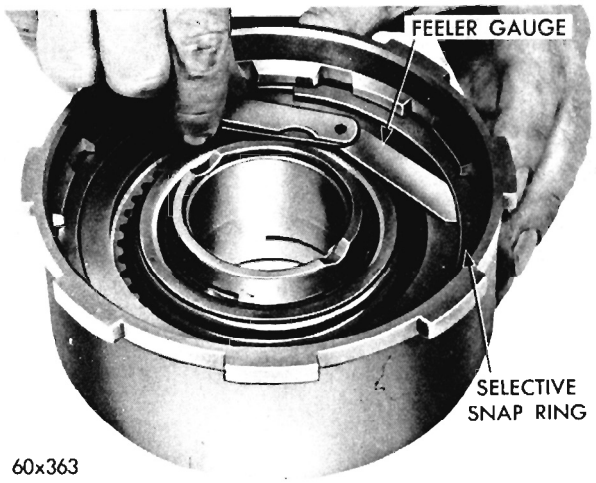


Fig. 83—Measuring Front Clutch Plate Clearance (Six Cylinder Cars)

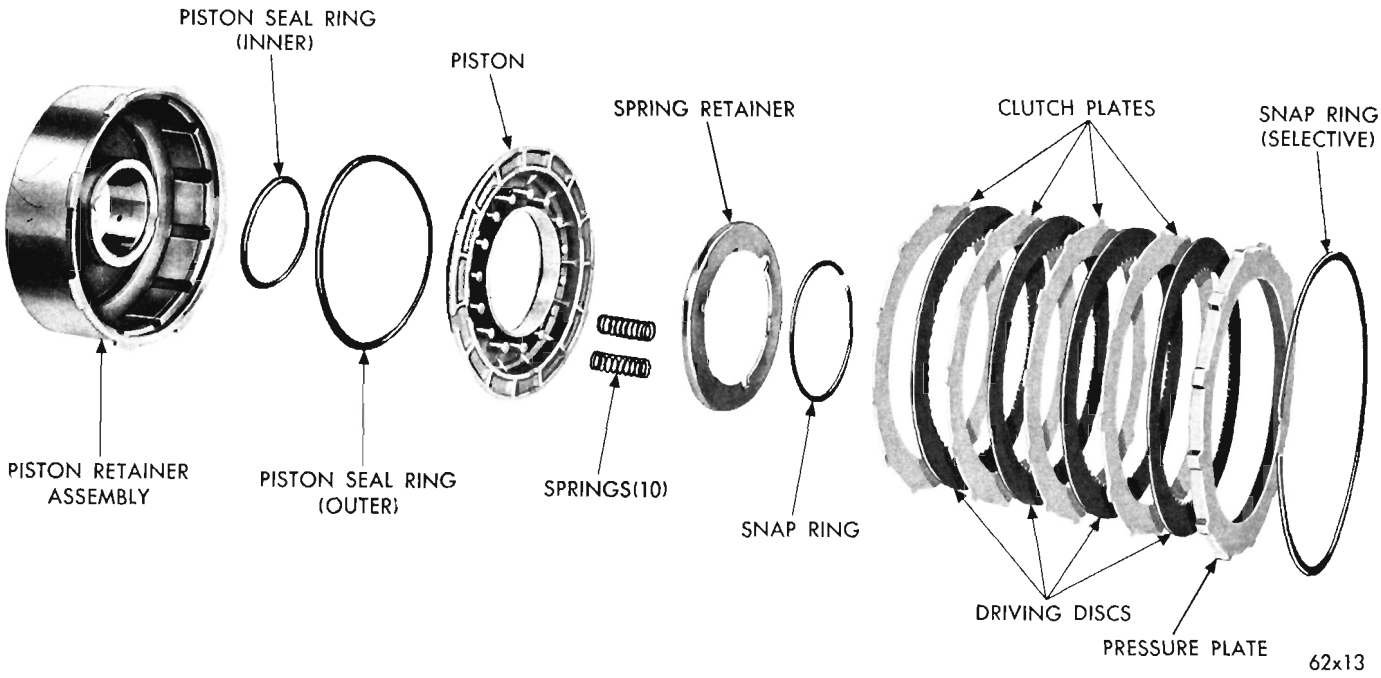


Fig. 84—Front Clutch Assembly—Disassembled (Eight Cylinder Cars)

hub of the clutch retainer. Make sure lip of the seal faces down and is properly seated in the groove.

(2) Lubricate and install the outer seal ring on the clutch piston, with lip of the seal toward bottom of the clutch retainer. Place piston assembly in the retainer and, with a twisting motion, seat the piston in the bottom of the retainer.

(3) Place the spring on the piston hub and position the spring retainer and snap ring on the spring. Compress the spring with Tool C-3575 (Fig. 81), and seat the snap ring in the hub groove. Remove the compressor tool.

(4) Lubricate all the clutch plates, install one steel plate followed by a lined plate until all the plates are installed. Install the pressure plate and snap ring. Make sure the snap ring is properly seated.

NOTE: The 170 cubic inch engine transmission uses three plates and discs in the front clutch and the 225 cubic inch engine uses four steel plates and discs.

(5) With the front clutch completely assembled, insert a feeler gauge between the pressure plate and snap ring (Fig. 83). The clearance should be .056 to .104 inch for the four plate clutch, and .042 to .087 inch for the three plate clutch. If not, install a snap ring of proper thickness to obtain the specified clearance.

NOTE: Snap rings are the same as those used in the rear clutch and are available in .060-.062; .068-.070 and .076-.078 inch thickness.

41. FRONT CLUTCH (Eight Cylinder Vehicles)

Disassembly

Figure 84 shows a disassembled view of the front clutch assembly.

(1) Using a screw driver, remove the large snap ring that secures the pressure plate in the clutch piston retainer. Lift the pressure plate and clutch plates out of the retainer.

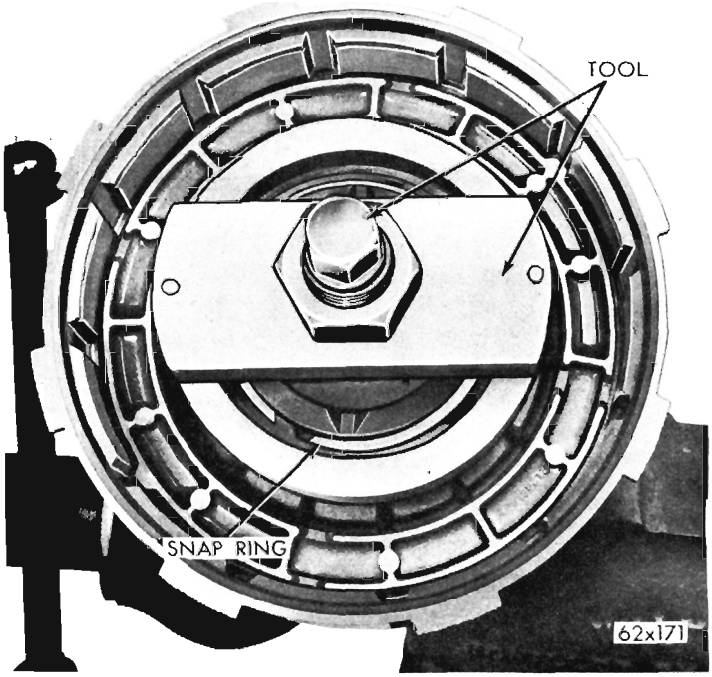


Fig. 85—Removing or Installing Front Clutch Spring Retainer Snap Ring (Eight Cylinder Cars)

(2) Install compressor, Tool C-3863 over the piston spring retainer, as shown in Figure 85. Compress the springs and remove the snap ring, then slowly release the tool until the spring retainer is free of the hub. Remove the tool, retainer and springs.

(3) Invert the clutch retainer assembly and bump it on a wood block to remove the piston. Remove the seals from the piston and clutch retainer hub.

Inspection

Inspect the facing material on all the driving discs. Replace discs that are charred, glazed or heavily pitted. Discs should also be replaced if they show evidence of material flaking off or if the facing material can be scraped off easily. Inspect the driving disc splines for wear or other damage. Inspect the steel plate and pressure plate surfaces for burning, scoring or damaged driving lugs. Replace if necessary.

Inspect the steel plate lug grooves in the clutch retainer for smooth surfaces, plates must travel freely in the grooves. Inspect the band contacting surface on the clutch retainer for scores. Note the ball check in the clutch retainer, make sure the ball moves freely. Inspect the seal surfaces in the clutch retainer for nicks or deep scratches, light scratches will not interfere with sealing of the neoprene rings. Inspect the clutch retainer bushing for wear or scores.

Inspect the inside bore of the piston for score marks, if light, remove with crocus cloth. Inspect the seal grooves for nicks and burrs. Inspect the neoprene seals for deterioration, wear, and hardness. Inspect the piston springs, retainer and snap ring for distortion.

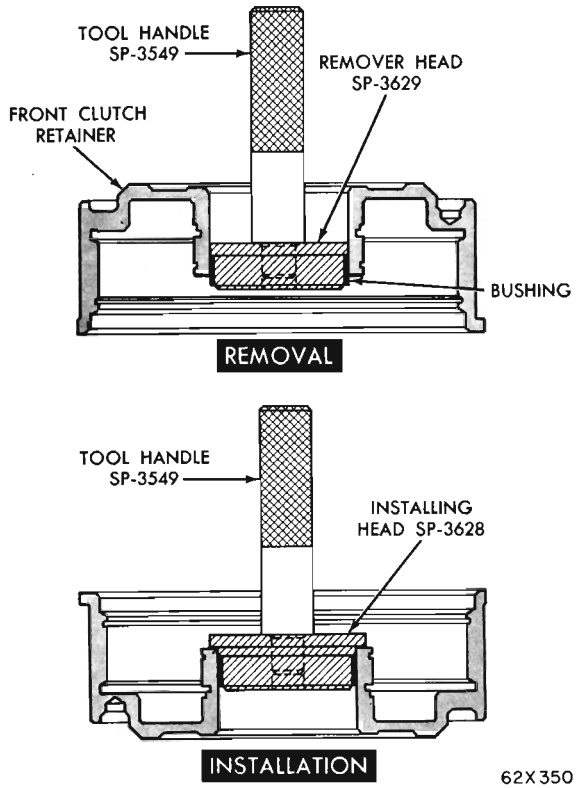


Fig. 86—Replacing Front Clutch Retainer Bushing (Eight Cylinder Cars)

Front Clutch Retainer Bushing Replacement

(1) Lay the clutch retainer (open end down) on a clean smooth surface and place the removing head Tool SP-3629 in the bushing. Install the handle Tool SP-3549 in the removing head (Fig. 86).

(2) Drive the bushing straight down and out of the clutch retainer bore. Be careful not to cock the tool in the bore.

(3) Lay the clutch retainer (open end up) on a clean smooth surface. Slide a new bushing on the installing head Tool SP-3628, and start them in the clutch retainer bore.

(4) Install handle Tool SP-3549 in the installer (Fig. 86). Drive the bushing into the clutch retainer until the tool bottoms.

(5) Thoroughly clean the clutch retainer before assembly and installation.

Assembly

(1) Lubricate and install the inner seal on hub of the clutch retainer. Make sure the lip of the seal faces down and is properly seated in the groove.

(2) Install the outer seal on the clutch piston, with the lip of seal toward the bottom of the clutch retainer. Apply a coating of "Door Ease" to the outer edge of the seal for easier installation of the piston



Fig. 87—Front Clutch Piston Return Springs—Location (Eight Cylinder Cars)

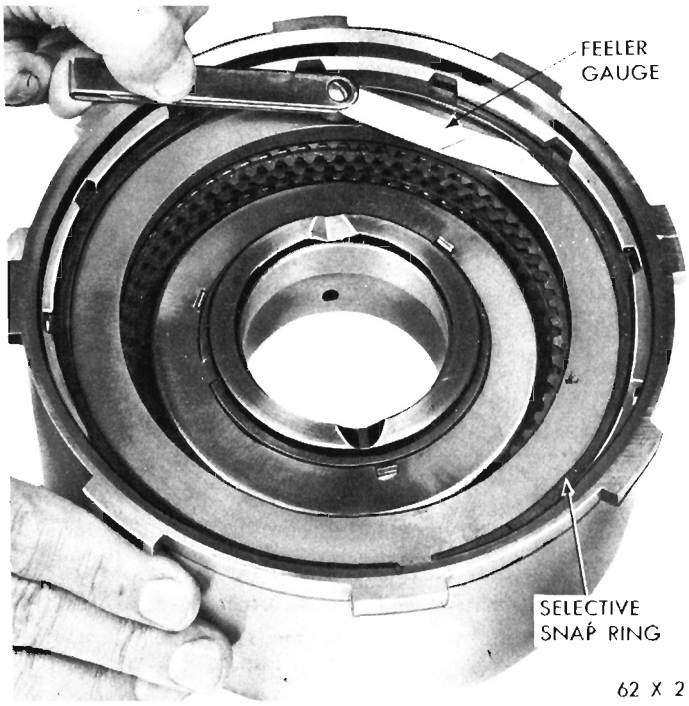


Fig. 88—Measuring Front Clutch Plate Clearance (Eight Cylinder Cars)

assembly. Place the piston assembly in the retainer and carefully seat the piston in the bottom of the retainer.

(3) Place the 10 springs on the piston hub exactly as shown in Figure 87. Position the spring retainer and snap ring on the springs. Compress the springs with Tool C-3863 (Fig. 85), and seat the snap ring in the hub groove. Remove the compressor tool.

(4) Lubricate all the clutch plates, install one steel plate followed by a lined plate until all the plates are installed. Install the pressure plate and snap ring. Make sure the snap ring is properly seated.

(5) With the front clutch completely assembled, insert a feeler gauge between the pressure plate and snap ring (Fig. 88). The clearance should be .024 to .123 inch. If not, install a snap ring of the proper thickness to obtain the specified clearance.

NOTE: Snap rings are the same as those used in the rear clutch and are available in .060-.062, .074-.076 and .088-.090 inch thickness.

42. REAR CLUTCH (Six Cylinder Vehicles)

Disassembly

Figure 89 shows a disassembled view of the rear clutch assembly.

(1) Using a screw driver, remove the large snap ring that secures the pressure plate in the clutch piston retainer. Lift the pressure plate, clutch plates, and inner pressure plate out of the retainer.

(2) Install compressor Tool C-3760 over the piston spring, as shown in Figure 90. Compress the spring just enough to clear snap ring, then remove the snap ring.

(3) Remove the compressor tool and piston spring. Invert the clutch retainer assembly and bump it on a wood block to remove the piston. Remove the seal rings from the piston.

(4) If necessary, remove the snap ring and press the input shaft from the piston retainer.

Inspection

Inspect the facing material on all the driving discs.

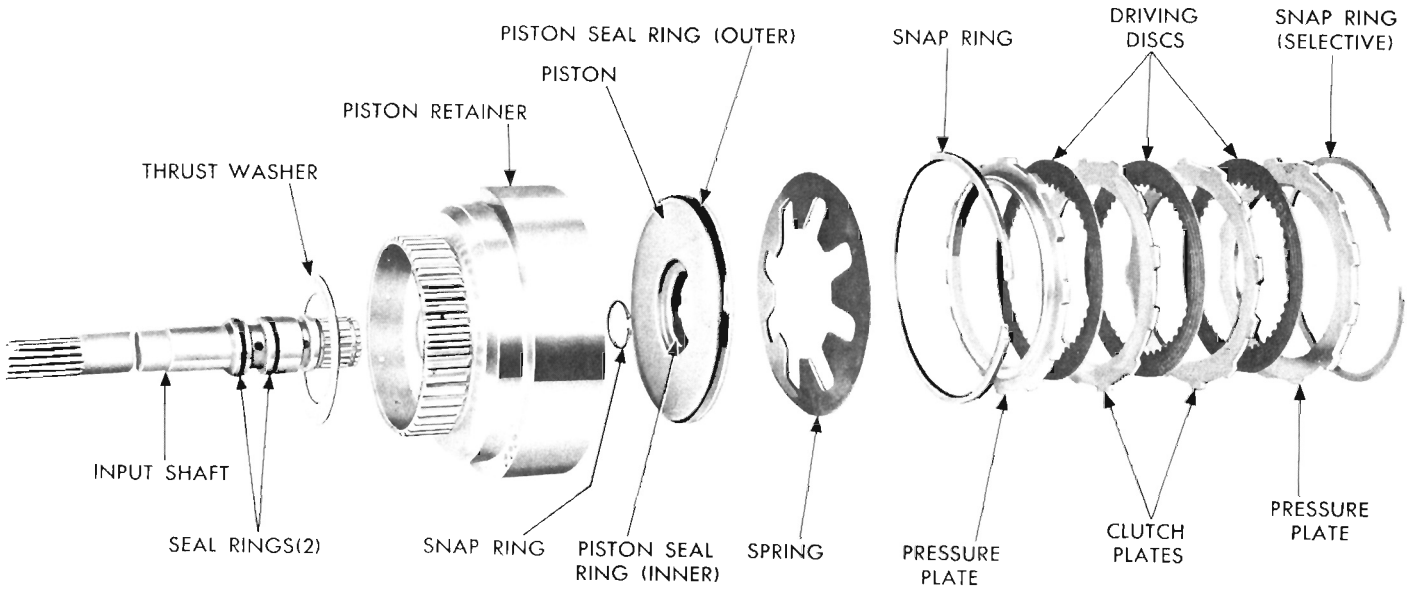


Fig. 89—Rear Clutch Assembly—Disassembled (Six Cylinder Cars)

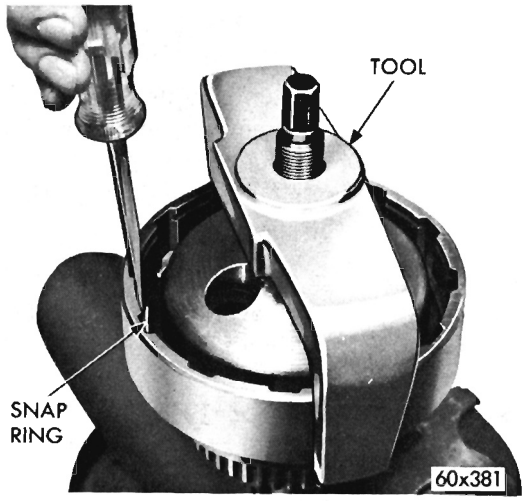


Fig. 90—Removing or Installing Rear Clutch Spring Retainer Snap Ring (Six Cylinder Cars)

Replace discs that are charred, glazed or heavily pitted. Discs should also be replaced if they show evidence of material flaking off or if the facing material can be scraped off easily. Inspect the driving disc splines for wear or other damage. Inspect the steel plate and pressure plate surface for burning, scoring or damaged driving lugs. Replace if necessary. Inspect the plates and discs for flatness, they must not be warped or cone-shaped.

Inspect the steel plate lug grooves in the clutch retainer for smooth surfaces, plates must travel freely in the grooves. Note the ball check in the clutch retainer, make sure the ball moves freely. Inspect the seal ring surfaces in the clutch retainer for nicks or deep scratches, light scratches will not interfere with sealing of the neoprene rings. Inspect the neoprene seal rings for deterioration, wear and hardness. Inspect the piston spring and snap rings for distortion.

Inspect the interlocking seal rings (Fig. 89) on the input shaft for wear or broken locks, make sure they turn freely in the grooves. Do not remove the rings unless conditions warrant. Inspect the rear clutch to front clutch thrust washer for wear. Washer thickness should be .043 to .045 inch, replace if necessary.

Assembly

(1) If removed, press the input shaft into the piston retainer and install the snap ring.

(2) Lubricate and install the inner and outer seal rings on the clutch piston. Make sure the lip of the seals face toward head of the clutch retainer, and are properly seated in the piston grooves.

(3) Place piston assembly in the retainer and, with a twisting motion, seat the piston in the bottom of the retainer.

(4) Place the spring over the piston with the outer edge of the spring positioned below the snap ring groove. Install compressor, Tool C-3760 over the spring (Fig. 90), compress the spring just enough to install the snap ring. Remove the compressor tool.

(5) Install the inner pressure plate in the clutch retainer with raised portion of plate resting on the spring.

(6) Lubricate all clutch plates, install one lined plate followed by a steel plate until all the plates are installed. Install the outer pressure plate and snap ring.

(7) With the rear clutch completely assembled, insert a feeler gauge between the pressure plate and snap ring (Fig. 91). The clearance should be between .018 to .036 inch. If not, install a snap ring of proper thickness to obtain the specified clearance.

NOTE: Rear clutch plate clearance is very important in obtaining the proper clutch operation. The clearance can be adjusted by the use of various thickness outer snap rings. Snap rings are available in .060-.062, .068-.070 and .076-.078 inch thickness.

43. REAR CLUTCH (Eight Cylinder Vehicles)

Disassembly

Figure 92 shows a disassembled view of the rear clutch assembly.

(1) Use a screw driver to remove the large snap ring that secures the pressure plate in the clutch retainer. Lift the pressure plate, clutch plates, and inner pressure plate out of the retainer.

(2) Remove the piston spring snap ring and remove the spring.

(3) Invert the clutch piston retainer assembly and bump it on a wood block to remove the piston. Remove the seals from the piston.

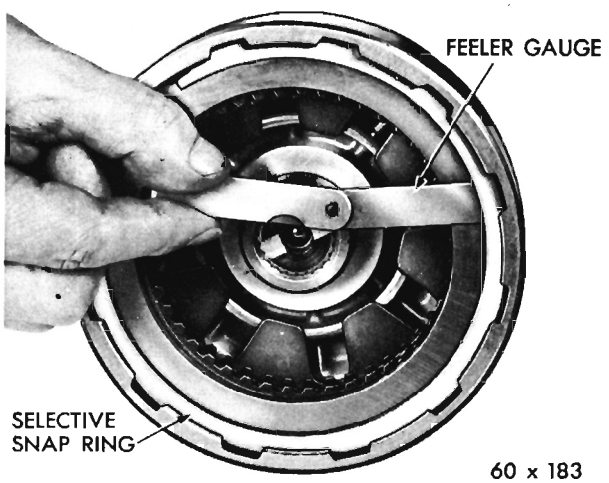


Fig. 91—Measuring Rear Clutch Plate Clearance (Six Cylinder Cars)

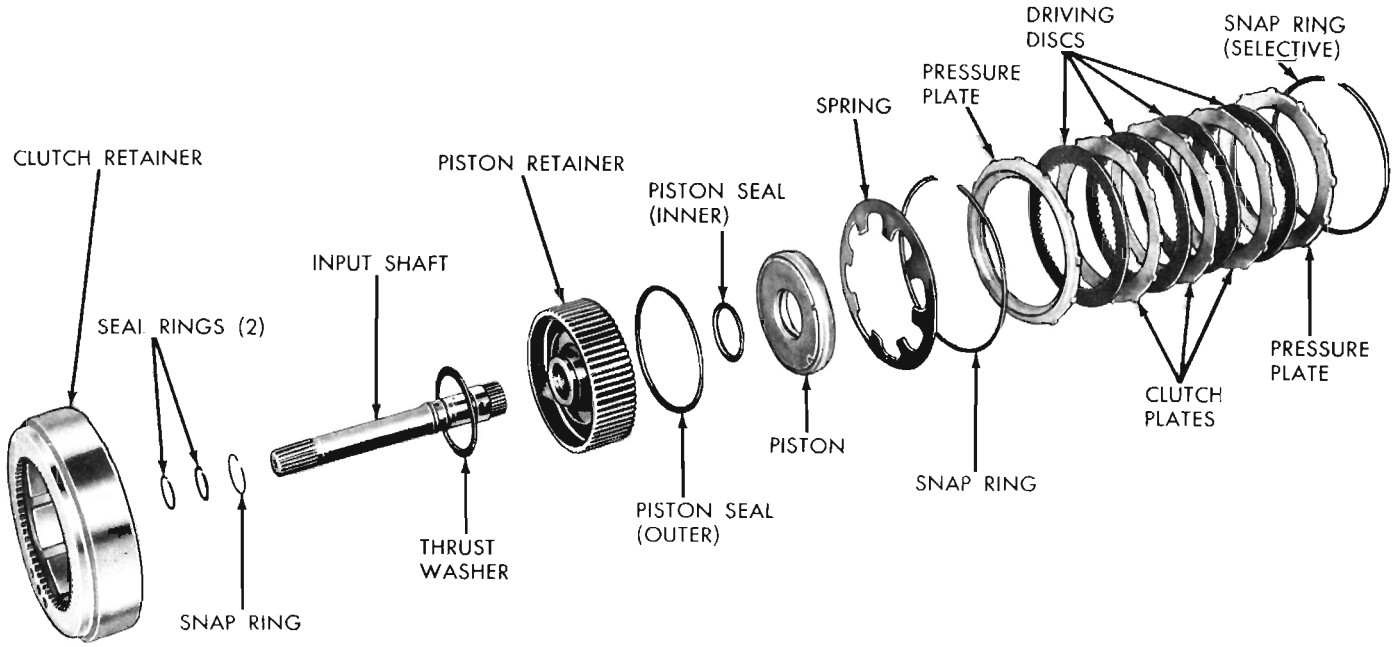


Fig. 92—Rear Clutch Assembly—Disassembled (Eight Cylinder Cars)

(4) If necessary, remove the snap ring and press the input shaft from the clutch piston retainer.

Inspection

Inspect the facing material on all the driving discs. Replace the discs that are charred, glazed or heavily pitted. Discs should also be replaced if they show evidence of material flaking off or if the facing material can be scraped off easily. Inspect the driving disc splines for wear or other damage. Inspect the steel plate and pressure plate surfaces for burning, scoring or damaged driving lugs. Replace if necessary.

Inspect the steel plate lug grooves in the clutch retainer for smooth surfaces, plates must travel freely in the grooves. Note the ball check in the piston, make sure the ball moves freely. Inspect the seal surfaces in the clutch retainer for nicks or deep scratches, light scratches will not interfere with sealing of the neoprene seals. Inspect the neoprene seals for deterioration, wear, and hardness. Inspect the piston spring and snap rings for distortion.

Inspect the interlocking seal rings (Fig. 92) on the input shaft for wear or broken locks, make sure they turn freely in the grooves. Do not remove the rings unless conditions warrant. Inspect the bushing in the input shaft for wear or scores. Inspect the rear clutch to front clutch thrust washer for wear. Washer thickness should be .061 to .063 inch, replace if necessary.

Input Shaft Bushing Replacement

(1) Clamp the input shaft in a vise with soft jaws, being careful not to clamp on the seal ring lands or bearing journals.

(2) Assemble the remover Tool SP-3630, the cup Tool SP-3633, and the hex nut Tool SP-1191.

(3) With the cup held firmly against the clutch piston retainer, thread the remover into the bushing as far as possible by hand (Fig. 93).

(4) Using a wrench, screw the remover into the bushing 3 to 4 additional turns to firmly engage the threads in the bushing.

(5) Turn the hex nut down against the cup to pull the bushing from the input shaft.

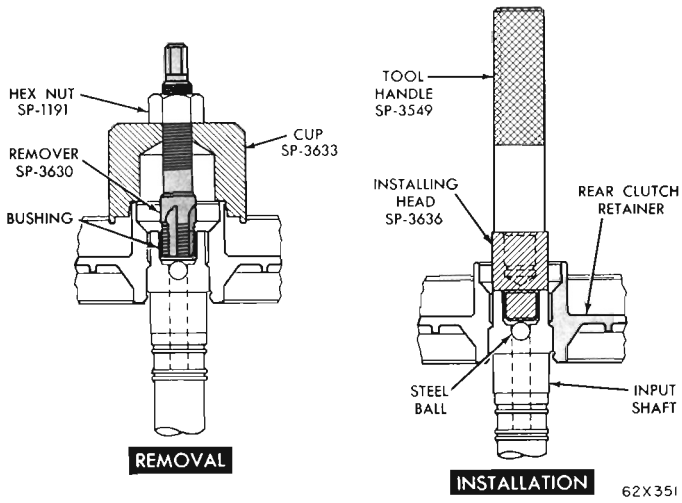


Fig. 93—Replacing Input Shaft Bushing (Eight Cyl. Cars)

(6) Thoroughly clean the input shaft to remove the chips made by the remover threads. Make certain the small lubrication hole next to the ball in the end of the shaft is not plugged with chips. Be sure no chips are lodged next to the steel ball.

(7) Slide a new bushing on the installing head Tool SP-3636, and start them in the bore of the input shaft.

(8) Stand the input shaft upright on a clean smooth surface and install handle Tool SP-3549 in the installing head (Fig. 93). Drive the bushing into the shaft until the tool bottoms.

(9) Thoroughly clean the input shaft and clutch piston retainer before assembly and installation.

Assembly

(1) If removed, press the input shaft into the clutch piston retainer and install the snap ring.

(2) Lubricate and install the inner and outer seal rings on the clutch piston. Make sure the lip of the seals face toward the head of the clutch retainer, and are properly seated in the piston grooves.

(3) Place the piston assembly in the retainer and, with a twisting motion, seat the piston in bottom of the retainer.

(4) Position the clutch retainer over the piston retainer splines and support the assembly so the clutch retainer remains in place.

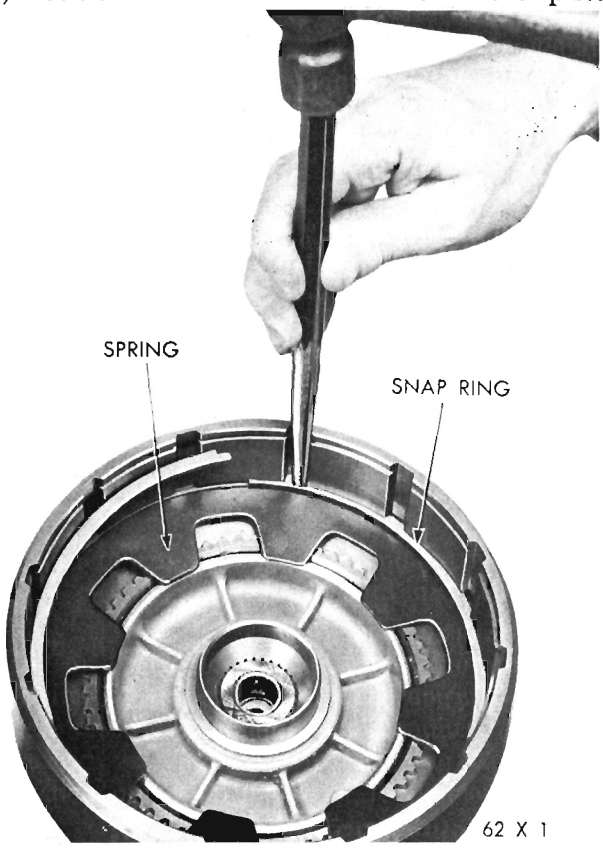


Fig. 94—Installing Rear Clutch Spring and Snap Ring (Eight Cylinder Cars)

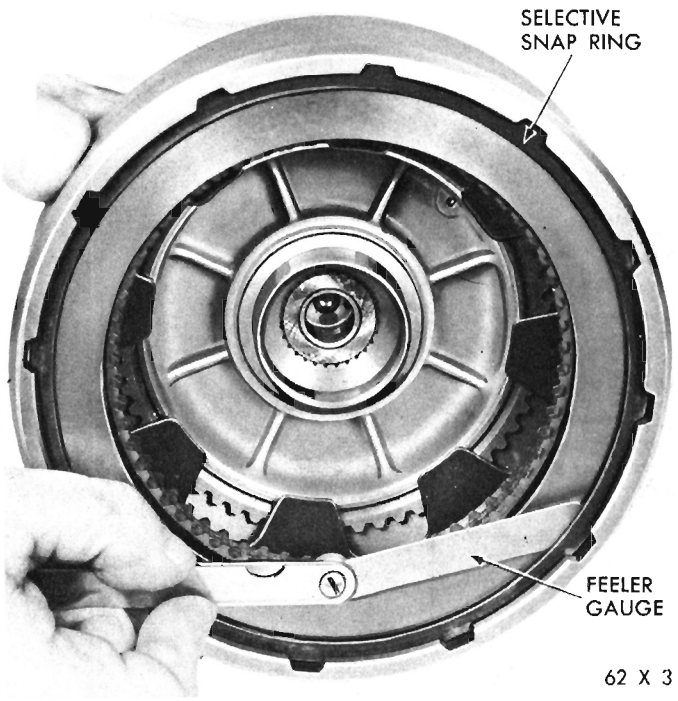


Fig. 95—Measuring Rear Clutch Plate Clearance (Eight Cylinder Cars)

(5) Place the spring over the piston with outer edge of spring positioned below the snap ring groove. Start one end of the snap ring in the groove, make sure the spring is exactly centered on the piston, then progressively tap the snap ring into the groove (Fig. 94). Be sure the snap ring is fully seated in the groove.

(6) Install the inner pressure plate in the clutch retainer with raised portion of the plate resting on the spring.

(7) Lubricate all the clutch plates, install one lined plate followed by a steel plate until all the plates are installed. Install the outer pressure plate and snap ring.

NOTE: The 318 cubic inch engine transmission uses three discs and two steel plates in the rear clutch, and the other V-8 engines use four discs and three steel plates.

(8) With the rear clutch completely assembled, insert a feeler gauge between the pressure plate and snap ring (Fig. 95). The clearance should be .022-.042 inch for the three-disc clutch and .026-.054 inch for the four-disc clutch. If not, install a snap ring of proper thickness to obtain the specified clearance. Low limit clearances are desirable.

NOTE: Rear clutch plate clearance is very important in obtaining proper clutch operation. The clear-

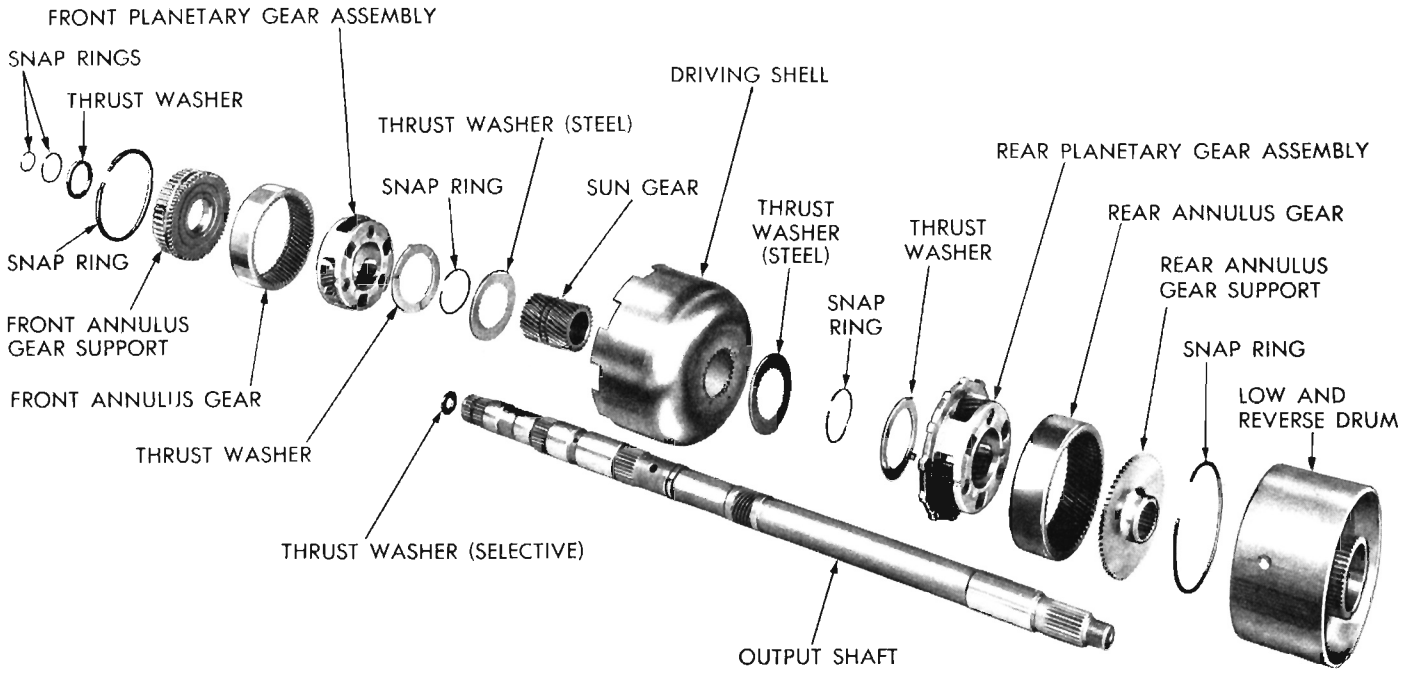


Fig. 96—Planetary Gear Assemblies, Sun Gear, Driving Shell, Low and Reverse Drum and Output Shaft—Disassembled (Six Cylinder Cars)

ance can be adjusted by the use of various thickness outer snap rings. Snap rings are available in .060-.062, .074-.076 and .088-.090 inch thickness.

44. PLANETARY GEAR ASSEMBLIES, SUN GEAR, DRIVING SHELL (Six Cylinder Vehicles)

Measure the end play of the planetary gear assemblies, sun gear and driving shell before removing these parts from the output shaft. With the assemblies in an upright position, push the rear annulus gear support downward on the output shaft. Insert a feeler gauge between the rear annulus gear support hub and the shoulder on the output shaft. (Refer to Figure 97). The clearance should be .006 to .046 inch.

Disassembly

(1) Remove the thrust washer from the forward end of the output shaft (Fig. 96).

(2) Remove the snap ring from the forward end of the output shaft, then slide the front planetary assembly off the shaft.

(3) Remove the snap ring and thrust washer from forward hub of the front planetary gear assembly, slide the front annulus gear and support off the planetary gear set (Fig. 96). Remove the thrust washer from rear side of the planetary gear set. If necessary, remove the snap ring from front of the annulus gear to separate the support from the annulus gear.

(4) Slide the sun gear, driving shell and rear planetary assembly off the output shaft.

(5) Lift the sun gear and driving shell off the rear

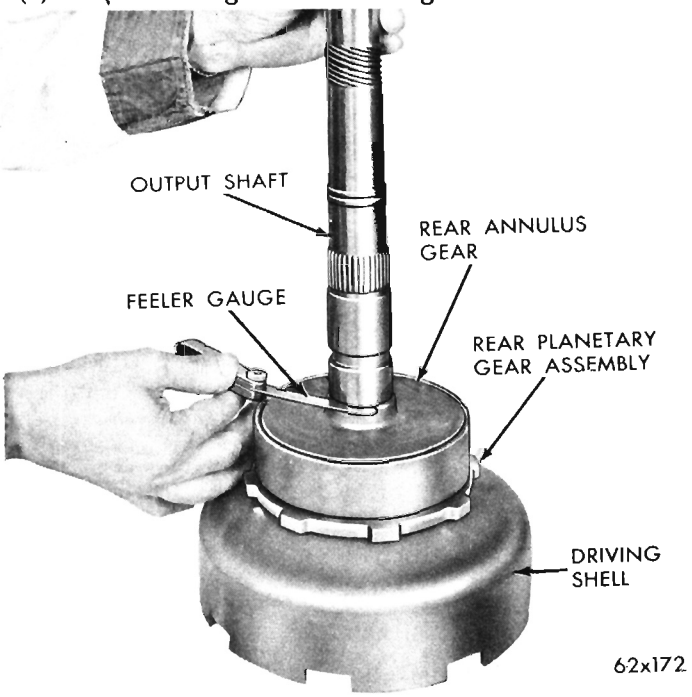


Fig. 97—Measuring End Play of Planetary Gear Assembly, Sun Gear and Driving Shell

planetary assembly. Remove the snap ring and steel washer from the sun gear (rear side of driving shell). Slide the sun gear out of the driving shell, and remove the snap ring and steel washer from the opposite end of the sun gear if necessary.

(6) Remove the thrust washer from the forward side of the rear planetary assembly and remove the planetary gear set from the rear annulus gear. If necessary, remove the snap ring from the rear of the annulus gear to separate the support from the annulus gear.

Inspection

Inspect the bearing surfaces on the output shaft for nicks, burrs, scores or other damage. Light scratches, small nicks or burrs can be removed with crocus cloth or a fine stone. Inspect the speedometer drive gear for any nicks or burrs, and remove with a sharp edged stone. Make sure all oil passages in the shaft are open and clean.

Inspect the bushings in the sun gear for wear or scores, replace the sun gear assembly if the bushings are damaged. Inspect all the thrust washers for wear and scores, replace as required. Inspect all the lock rings for distortion. Inspect annulus gear and driving gear teeth for damage. Inspect the planetary gear carrier for cracks and pinions for broken or worn gear teeth and for broken pinion shaft lock pins.

Assembly

Refer to Figure 96 for parts reference.

(1) Place the rear annulus gear support in the annulus gear and install the snap ring.

(2) Position the rear planetary gear assembly in the rear annulus gear and place the thrust washer on the front side of the planetary gear assembly.

(3) Insert the output shaft in the rear opening of the rear annulus gear. Carefully work the shaft through the annulus gear support and planetary gear assembly. Make sure the shaft splines are fully engaged in splines of the annulus gear support.

(4) Install the steel washer and snap ring on one end of the sun gear. Insert the sun gear through the front side of the driving shell, install the rear steel washer and snap ring.

(5) Carefully slide the driving shell and sun gear assembly on the output shaft, engaging the sun gear teeth with the rear planetary pinion teeth.

(6) Place the front annulus gear support in the annulus gear and install the snap ring.

(7) Position the front planetary gear assembly in the front annulus gear, place thrust washer over the planetary gear assembly hub and install the snap ring. Position the thrust washer on the rear side of the planetary gear assembly.

(8) Carefully work the front planetary and annulus gear assembly on the output shaft, meshing the planetary pinions with the sun gear teeth.

(9) With all the components properly positioned, install the retaining snap ring on the front end of the output shaft. Re-measure the end play of the assembly.

45. PLANETARY GEAR ASSEMBLIES, SUN GEAR, DRIVING SHELL (Eight Cylinder Vehicles)

Measure the end play of the planetary gear assemblies, sun gear and driving shell before removing these parts from the output shaft. With the assembly in an upright position, push the rear annulus gear support downward on the output shaft. Insert a feeler gauge between the rear annulus gear support hub and the shoulder on the output shaft (Fig. 97). The clearance should be .010 to .039 inch.

Disassembly

(1) Remove the thrust washer from the forward end of the output shaft (Fig. 98).

(2) Remove the snap ring from the forward end of the output shaft, then slide the front planetary assembly off the shaft.

(3) Slide the front annulus gear off the planetary gear set (Fig. 98). Remove the thrust washer from the rear side of the planetary gear set.

(4) Slide the sun gear, driving shell and the rear planetary assembly off the output shaft.

(5) Lift the sun gear and driving shell off the rear planetary gear assembly. Remove the thrust washer from inside the driving shell. Remove snap ring and steel washer from the sun gear (rear side of driving shell) and slide the sun gear out of the shell. Remove the front snap ring from the sun gear if necessary. Note that the front end of the sun gear is longer than the rear.

(6) Remove the thrust washer from the forward side of the rear planetary gear assembly, remove the planetary gear set from the rear annulus gear.

Inspection

Inspect the bearing surfaces on the output shaft for nicks, burrs, scores or other damage. Light scratches, small nicks or burrs can be removed with crocus cloth or a fine stone. Inspect the speedometer drive gear for any nicks or burrs, and remove with a sharp edged stone. Make sure all oil passages in the shaft are open and clean.

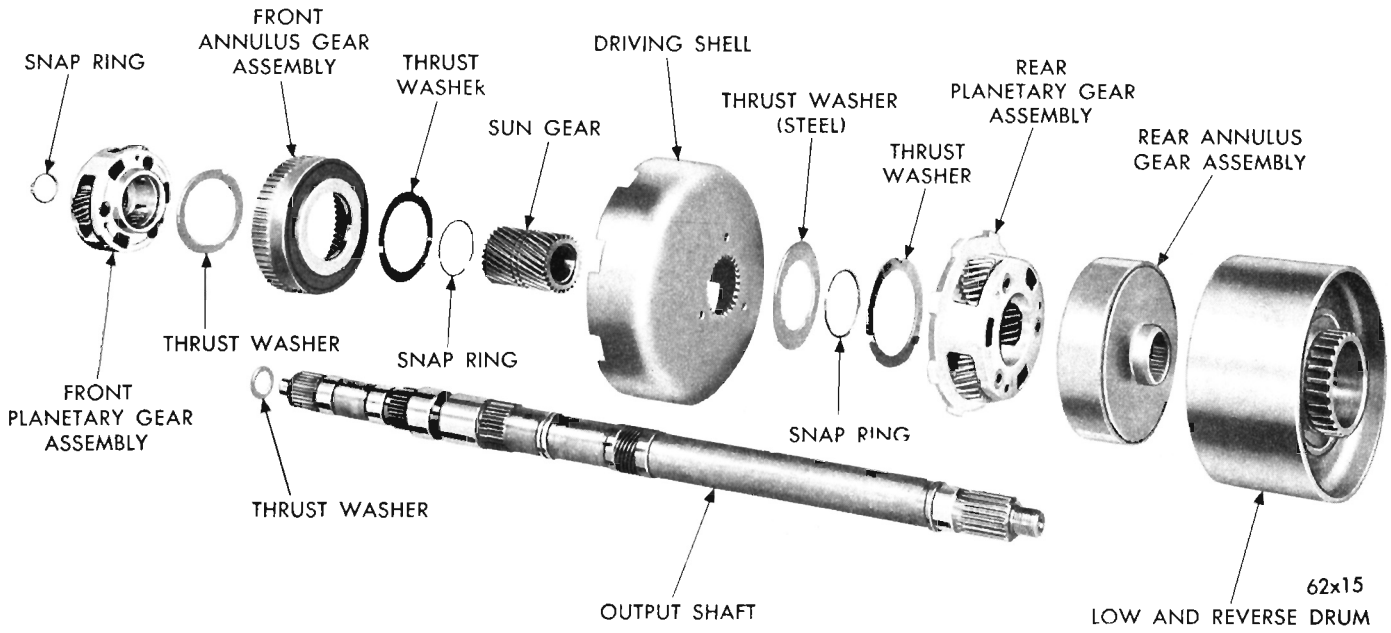


Fig. 98—Planetary Gear Assemblies, Sun Gear, Driving Shell, Low and Reverse Drum and Output Shaft—Disassembled (Eight Cylinder Cars)

Inspect bushings in the sun gear for wear or scores, replace the sun gear assembly if bushings are damaged. Inspect all the thrust washers for wear and scores, replace if damaged or worn below specifications. Inspect the thrust faces of the planetary gear carriers for wear, scores or other damage, replace as required. Inspect the planetary gear carrier for cracks and pinions for broken or worn gear teeth and for broken pinion shaft lock pins. Inspect the annulus gear and driving gear teeth for damage. Replace distorted lock rings.

Assembly

Refer to Figure 98 for parts reference.

(1) Position the rear planetary gear assembly in the rear annulus gear. Place the thrust washer on the front side of the planetary gear assembly.

(2) Insert the output shaft in the rear opening of the rear annulus gear. Carefully work the shaft through the annulus gear and planetary gear assembly. Make sure the shaft splines are fully engaged in splines of the annulus gear.

(3) Install the snap ring in the front groove of the sun gear (long end of gear). Insert the sun gear through the front side of the driving shell, install the rear steel washer and snap ring.

(4) Carefully slide the driving shell and sun gear assembly on the output shaft, engaging the sun gear teeth with the rear planetary pinion teeth. Place the thrust washer inside the front driving shell.

(5) Place the thrust washer on the rear hub of the front planetary gear set, then slide the assembly into the front annulus gear.

(6) Carefully work the front planetary and annulus gear assembly on the output shaft, meshing the planetary pinions with the sun gear teeth.

(7) With all components properly positioned, install the retaining snap ring on the front end of the output shaft. Re-measure the end play of the assembly.

46. OVERRUNNING CLUTCH

Inspection

Inspect the clutch rollers for smooth round surfaces, they must be free of flat spots and chipped edges. Inspect the roller contacting surfaces in the

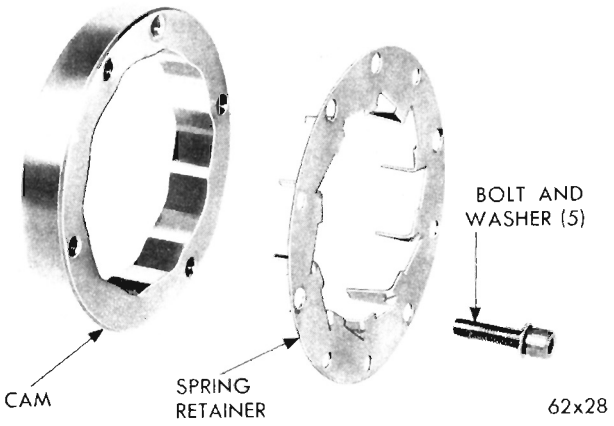


Fig. 99—Overrunning Clutch Service Replacement Cam (Six Cylinder Cars)

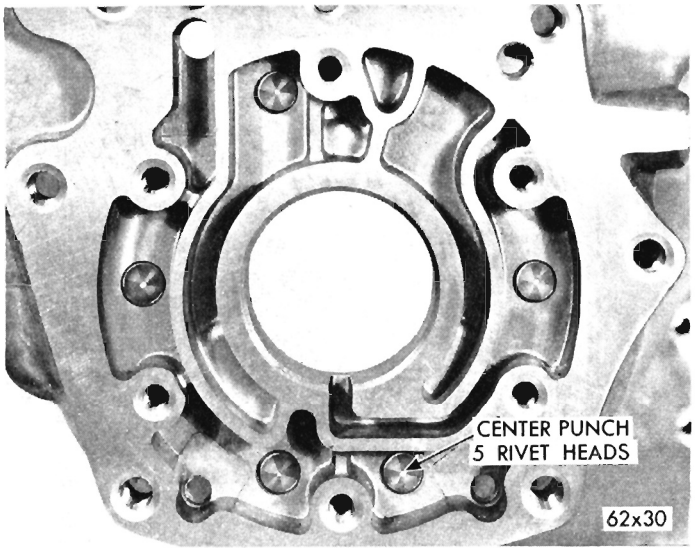


Fig. 100—Center Punch Rivet Heads (Six Cyl. Cars)

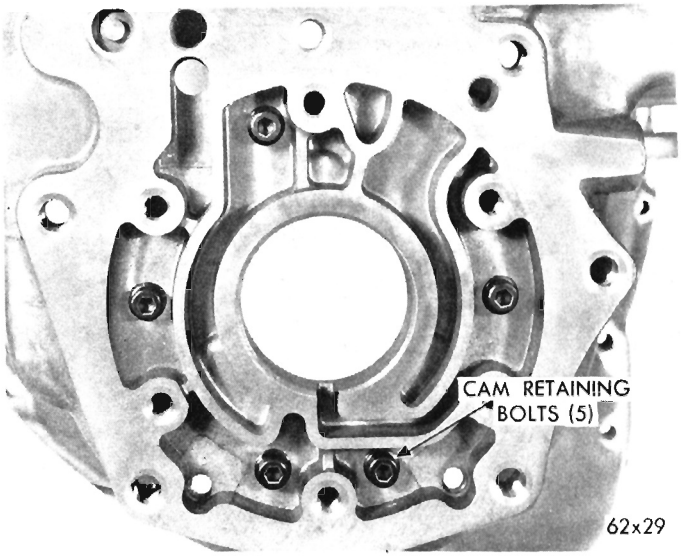


Fig. 101—Cam Retaining Bolts Installed (Six Cyl. Cars)

cam and race for brinelling. Inspect the roller springs for distortion, wear or other damage. Eight Cylinder Vehicles: Inspect the cam set screw for tightness. If loose, tighten and restake the case around the screw. Six Cylinder Vehicles: Inspect the low and reverse drum thrust washer (behind the overrunning clutch hub) for wear or scores.

Overrunning Clutch Cam Replacement (Six Cylinder Vehicles)

If the overrunning clutch cam or spring retainer are found damaged, they can be replaced with a service replacement cam, spring retainer, and retaining bolts (Fig. 99). The service parts are retained in the case with bolts instead of rivets. To install, proceed as follows:

(1) Drive the rear oil pump body rearward out of the case with a wood block and hammer.

(2) Center punch the rivets **exactly** in the center of each rivet head (Fig. 100).

(3) Drill through each rivet head with a 3/8 inch drill. **Be very careful not to drill into the transmission case.** Chip off the rivet heads with a small chisel, then drive the rivets and cam from the case with a blunt punch of proper size.

(4) Carefully enlarge the rivet holes in the case with a 17/64 inch drill. Remove all chips and foreign matter from the case, make sure the cam area is free of chips and burrs.

(5) To install, position the cam and roller spring retainer in the case. Align the cam bolt holes with the holes in the case, then thread all five retaining bolt and washer assemblies into the cam a few turns. The belleville washers must be installed so its inner diameter is coned toward the bolt head (Fig. 101).

(6) Tap the cam firmly into the case if necessary. Draw the retaining bolts down evenly, then tighten to 100 inch-pounds torque.

(7) To install the rear oil pump body, refer to Paragraph 37.

Overrunning Clutch Cam Replacement (Eight Cylinder Vehicles)

If the overrunning clutch cam and/or the roller spring retainer are found damaged, replace the cam and spring retainer in the following manner:

(1) Remove the set screw from the case below the clutch cam.

(2) Insert a punch through the pump body bolt holes and drive the cam from the case (Fig. 102). Alternate the punch from one bolt hole to another so the cam will be driven evenly from the case.

(3) Clean all burrs and chips from the cam area in the case.

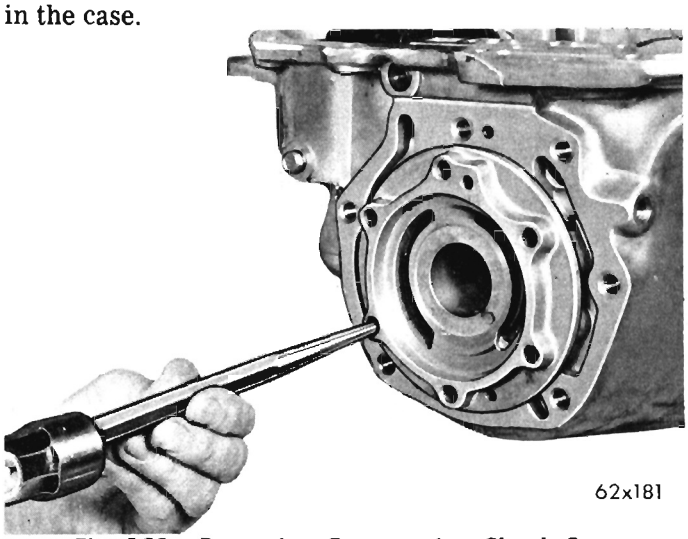


Fig. 102—Removing Overrunning Clutch Cam (Eight Cylinder Cars)

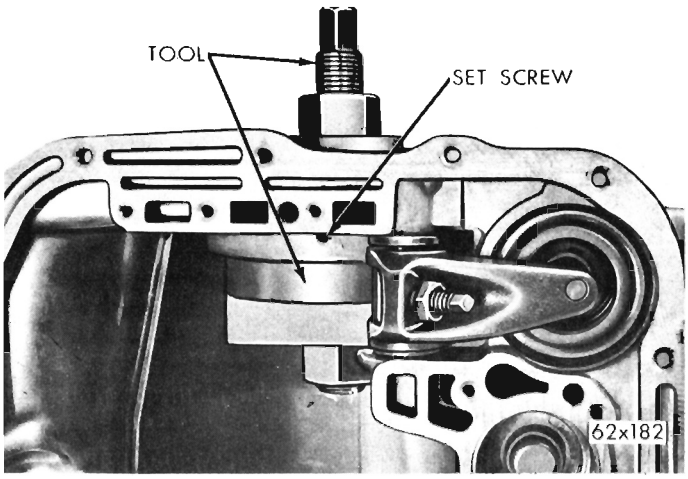


Fig. 103—Installing Overrunning Clutch Cam (Eight Cylinder Cars)

(4) Place the spring retainer on the cam, making sure the retainer lugs snap firmly into the notches on the cam.

(5) Position the cam in the case with cam serrations aligned with those in the case. Tap the cam **evenly** into the case as for as possible with a soft mallet.

(6) Install Tool C-3863, as shown in Figure 103, tighten nut on the tool to seat the cam into the case. Make sure the cam is firmly bottomed, then install the cam retaining set screw. Stake the case around the set screw to prevent it from coming loose.

47. KICKDOWN SERVO AND BAND

Inspection

Figure 104 shows a disassembled view of the kickdown servo assembly.

NOTE: The large outer spring shown in Figure 104 is not used in the Six Cylinder Vehicle transmission. Also, the large outer spring is not used in the maximum performance Eight Cylinder Vehicle transmissions.

Inspect the piston and guide seal rings for wear, and make sure they turn freely in the grooves. It is not necessary to remove the seal rings unless conditions warrant. Inspect the piston for nicks, burrs, scores and wear. Inspect the piston bore in the case for scores or other damage. Inspect the fit of the guide on the piston rod. Inspect the piston spring for distortion.

Inspect the band lining for wear and bond of lining to the band. Inspect the lining for black burn marks, glazing, non-uniform wear pattern and flaking. If the lining is worn so the grooves are not visible at the ends or any portion of the bands, replace the band. Inspect the band for distortion or cracked ends.

48. LOW AND REVERSE SERVO AND BAND

Disassembly

(1) Remove the snap ring from the piston and re-

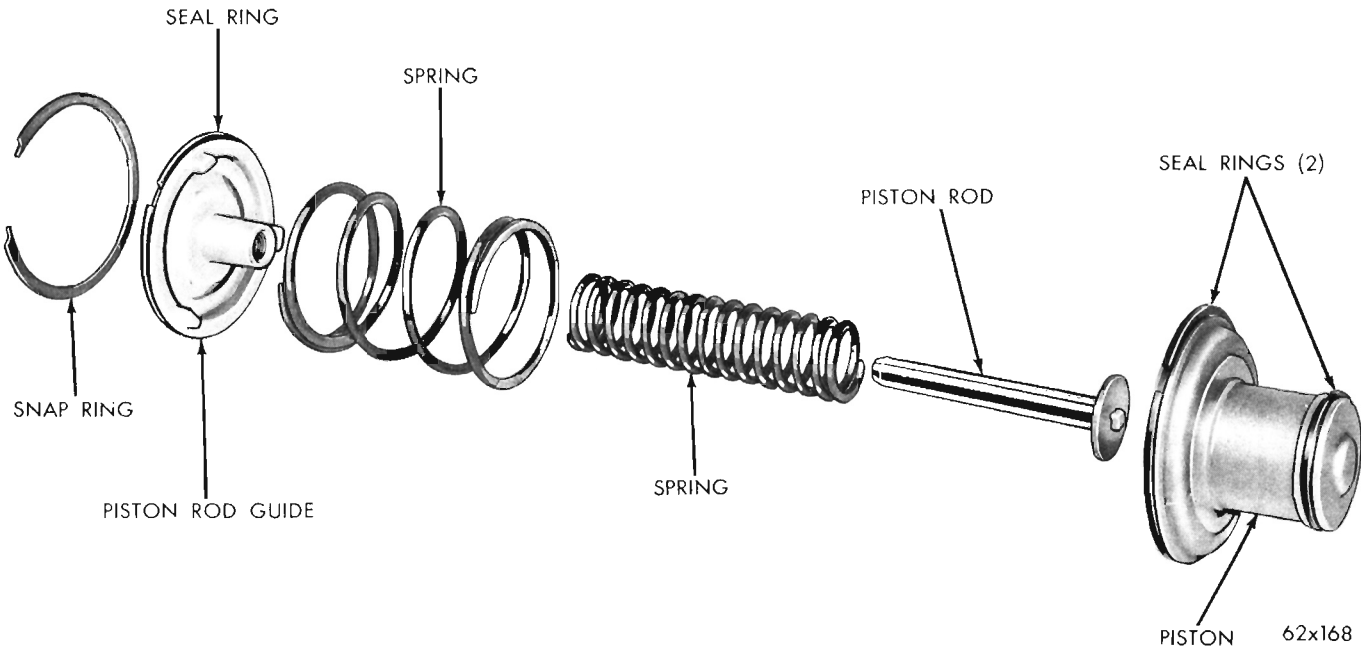


Fig. 104—Kickdown Servo (Disassembled)

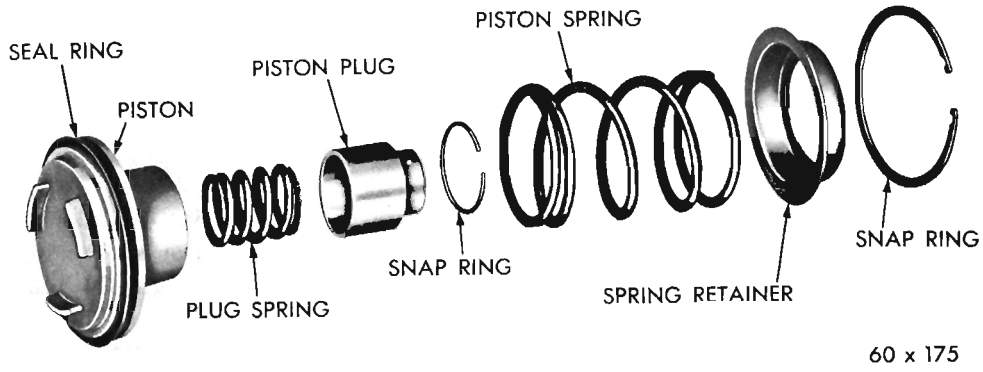


Fig. 105—Low and Reverse Servo (Disassembled)

move the piston plug and spring (Fig. 105).

Inspection

Inspect the seal for deterioration, wear and hardness. Inspect the piston and piston plug for nicks, burrs, scores and wear; piston plug must operate freely in the piston. Inspect the piston bore in the case for scores or other damage. Inspect the springs for distortion.

Inspect the band lining for wear and bond of lining to the band. If the lining is worn so the grooves are not visible at the ends or any portion of the band, replace the band. Inspect the band for distortion or cracked ends.

Assembly

(1) Lubricate and insert the piston plug and spring in the piston, and secure with the snap ring.

49. INSTALLATION OF SUB-ASSEMBLIES

The assembly procedures given here include the installation of the sub-assemblies in the transmission case and adjusting the drive train end play. Do not use force to assemble mating parts. If the parts do not assemble freely, investigate the cause, and correct the trouble before proceeding with the assembly procedures. Always use new gaskets during the assembly operations.

IMPORTANT: Use only Automatic Transmission Fluid Type "A" Suffix "A" to lubricate the transmission parts during assembly.

Overrunning Clutch

(1) **Six Cylinder Vehicles:** Place the low and reverse drum thrust washer inside the overrunning clutch cam, then install the clutch hub (race) with its undercut end (inner diameter) next to the thrust washer. Install the springs and rollers exactly as shown in Figure 106.

Eight Cylinder Vehicles: Insert the clutch hub (race) inside the overrunning clutch cam, then install the springs and rollers exactly as shown in Figure 106.

Low and Reverse Servo and Band

(1) Carefully work the servo piston assembly into the case with a twisting motion. Place the spring, retainer and snap ring over the piston (Fig. 105).

(2) Compress the low and reverse servo piston spring by using engine valve spring compressor Tool C-3422, then install the snap ring.

(3) Position the rear band in the case, install the short strut, then connect the long lever and strut to the band (Fig. 107). Screw in the band adjuster just enough to hold the struts in place. Install the low-reverse drum.

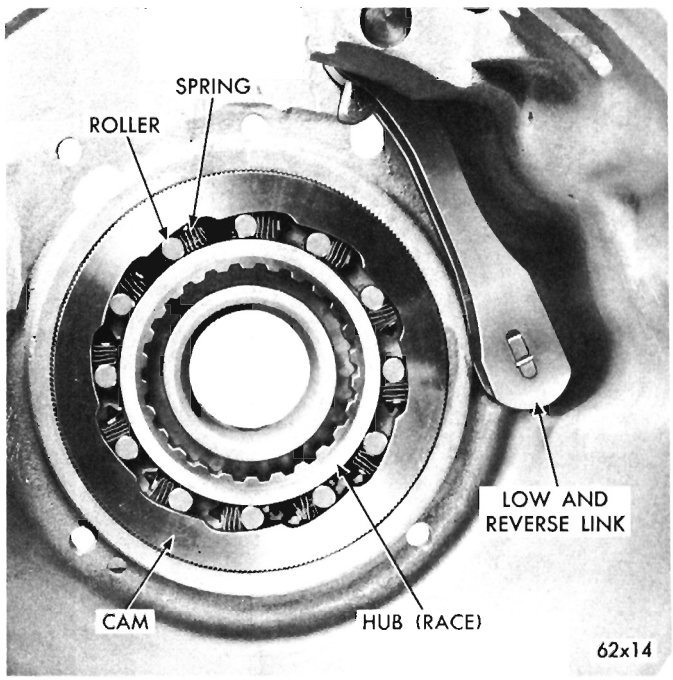


Fig. 106—Overrunning Clutch, Low and Reverse Band Link

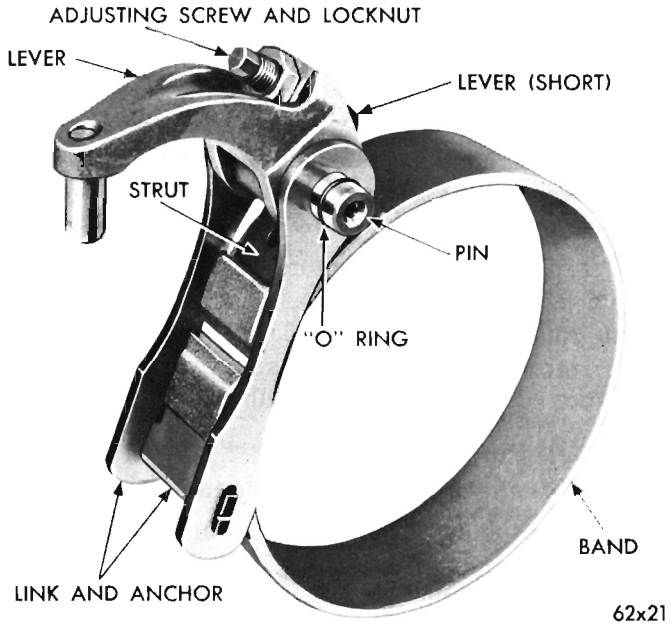


Fig. 107—Low-Reverse Band and Linkage

Eight Cylinder Vehicles: Be sure the long lever and strut assembly is installed, as shown in Figure 106 to provide the running clearance for the low and reverse drum.

Kickdown Servo

(1) Carefully push the servo piston into the case bore. Install the piston rod, the two springs and the guide (Fig. 104). **The Six Cylinder Vehicle transmission uses one small spring only.** Also, one small spring only is used in the maximum performance Eight Cylinder Vehicle transmissions.

(2) Compress the kickdown servo springs by using engine valve spring compressor Tool C-3422, then install the snap ring.

Planetary Gear Assemblies, Sun Gear, Driving Shell

(1) While supporting the assembly in the case, insert the output shaft through the rear pump housing. Carefully work the assembly rearward engaging the rear planetary carrier lugs into the low-reverse drum slots.

CAUTION: Be very careful not to damage the ground surfaces on the output shaft during installation.

(2) Six Cylinder Vehicles: Apply a coat of grease to the selective thrust washer (Fig. 96) and install the washer on the front end of the output shaft.

NOTE: If the drive train end play was not within specifications (.022-.071 inch), when tested in Paragraph 29, replace the thrust washer with one of proper thickness.

The following selective washers are available for the Six Cylinder Vehicle transmission:

Thickness	Color
.052-.054 inch	Natural
.068-.070 inch	Red
.083-.085 inch	Black

Input Shaft and Rear Clutch

(1) Invert the transmission and support in an upright position with the output shaft downward.

(2) Align the rear clutch plate inner splines, lower the input shaft and clutch assembly into position in the case.

(3) Carefully work the clutch assembly in a circular motion to engage the clutch splines over splines of the front annulus gear.

(4) Coat one side of the fiber thrust washer with heavy grease, then position the washer in the recess on front face of the rear clutch piston retainer.

Front Clutch

(1) Align the front clutch plate inner splines, lower the clutch assembly into position in the case.

(2) Carefully work the clutch assembly in a circular motion to engage the clutch splines over splines of the rear clutch piston retainer. Make sure the front clutch driving lugs are fully engaged in the slots in the driving shell.

Front Band

Figure 108 shows a disassembled view of the kickdown band assembly.

(1) Slide the band over the front clutch assembly.

(2) Install the band strut, screw in the adjuster just enough to hold the strut and anchor in place.

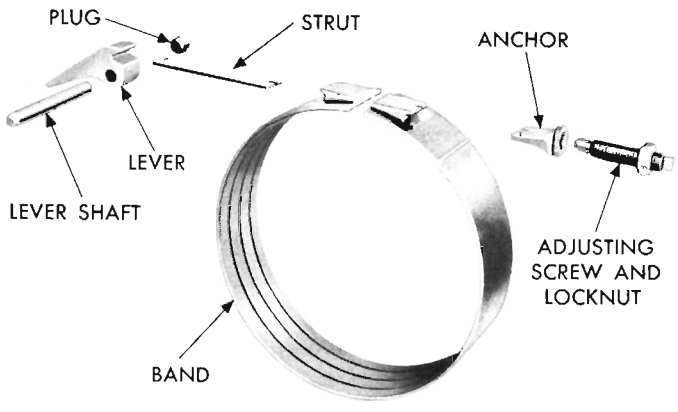


Fig. 108—Kickdown Band and Linkage (Disassembled)

Front Oil Pump and Reaction Shaft Support

If difficulty was encountered in removing the front oil pump assembly due to an exceptionally tight fit in the case, it may be necessary to expand the case with heat during the pump installation. Using a suitable heat lamp, heat the case in the area of the front pump for a few minutes prior to installing the front pump and reaction shaft support assembly.

Eight Cylinder Vehicles: If the drive train end play was not within specifications (.030-.069 inch) when tested in Paragraph 29, replace the thrust washer on the reaction shaft support hub with one of proper thickness.

The following selective thrust washers are available for the Eight Cylinder Vehicle transmission.

Thickness	Color
.043-.045 inch	Natural
.061-.063 inch	Green
.084-.086 inch	Red
.102-.104 inch	Yellow

(1) Screw two pilot studs, Tool C-3288 in the front oil pump opening in the case (Fig. 109). Install a new gasket over the pilot studs.

(2) Place a new rubber seal ring in the groove on the outer flange of oil pump housing. Make sure the seal ring is not twisted. Coat the seal ring with grease for easy installation.

(3) Insert aligning Tool C-3756 (Six Cylinder Vehicles) or Tool C-3881 (Eight Cylinder Vehicles) through the pump body and engage the inner rotor.

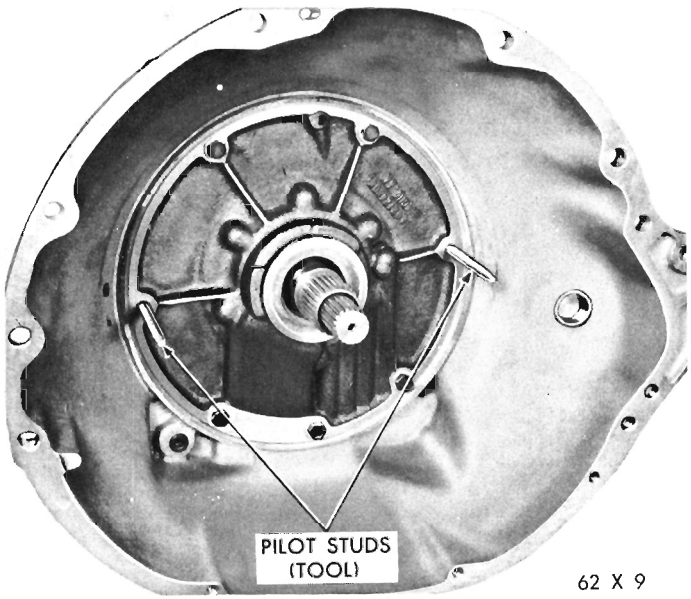


Fig. 109—Installing Front Pump and Reaction Shaft Support Assembly

(4) Install the assembly in the case, tap lightly with a soft mallet if necessary. Place the deflector over the vent opening and install four pump body bolts, remove pilot studs and install the remaining bolts. Snug the bolts down evenly, then tighten to 150 inch-pounds torque. **The Six Cylinder Vehicle transmission does not use a deflector over the vent opening.**

(5) Rotate the pump rotors with Tool C-3881 or Tool C-3756 until the two small holes in the handle of the tool are vertical (Fig. 51). This will locate the inner rotor so the converter impeller shaft will engage the inner rotor lugs during installation.

Rear Oil Pump

(1) Place the outer rotor in the pump body.

(2) Turn the output shaft so the inner rotor driving ball pocket is up. Install the ball and slide the inner rotor on the output shaft in alignment with the ball (Fig. 45).

(3) Install the oil pump cover with the retaining bolts threaded in a few turns. Slide aligning sleeve, Tool C-3762 (Six Cylinder Vehicles) or Tool C-3864 (Eight Cylinder Vehicles) all the way in until it bottoms against the rotors (Fig. 46), then tighten the cover bolts evenly to 140 inch-pounds torque.

Governor and Support

(1) Position the support and governor body assembly on the output shaft. Align the assembly so the governor valve shaft hole in the governor body aligns with the hole in the output shaft, then slide the assembly into place. Install the snap ring behind the governor body (Fig. 43). Tighten the body to support bolts to 100 inch-pounds torque. Bend the ends of the lock straps against the bolt heads.

(2) Place the governor valve on the valve shaft, insert the assembly into the body and through the governor weights. Install the valve shaft retaining snap ring.

Extension Housing

(1) Using a new gasket, carefully slide the extension housing into place. Install the retaining bolts and washers, tighten bolts to 25 foot-pounds torque.

(2) Install the transmission output shaft flange. Install washer with its three projections toward the flange and the nut with its convoluted surface contacting the washer. Hold the flange with Tool C-3281, and tighten nut to 175 foot-pounds torque. Torque reading must be taken as the nut passes over the hump.

IMPORTANT: Inspect the drive train end play as described in Paragraph 29. Correct if necessary.

Valve Body Assembly and Accumulator Piston

(1) Clean mating surfaces and inspect for burrs on both the transmission case and the valve body steel plate.

(2) Install the accumulator piston in the transmission case and place the piston spring on the accumulator piston.

(3) Carefully position the valve body assembly in the transmission case, install the retaining bolts and tighten finger tight. With the neutral starting switch installed, place the manual valve in the neutral position. Shift the valve body if necessary to center the neutral finger over the neutral switch plunger. Snug the bolts down evenly, then tighten to 100 inch-pounds torque.

(4) Connect the control cable adapter to the manual lever and install the retaining nut.

(5) Install the seal, flat washer and throttle lever on the throttle shaft. Tighten the clamp bolt.

(6) Adjust the kickdown, and low-reverse bands, as described in Paragraph 12.

(7) Install the oil pan, using a new gasket. Tighten the pan bolts to 150 inch-pounds torque.

50. STARTER RING GEAR REPLACEMENT

The starter ring gear is mounted directly on the outer diameter of the torque converter front cover. With the torque converter removed from the vehicle, replacement of the gear is as follows:

Removing Ring Gear

(1) Cut through the weld material at the rear side of ring gear with a hack saw or grinding wheel (Fig. 110). Be careful not to cut or grind into the front cover stamping.

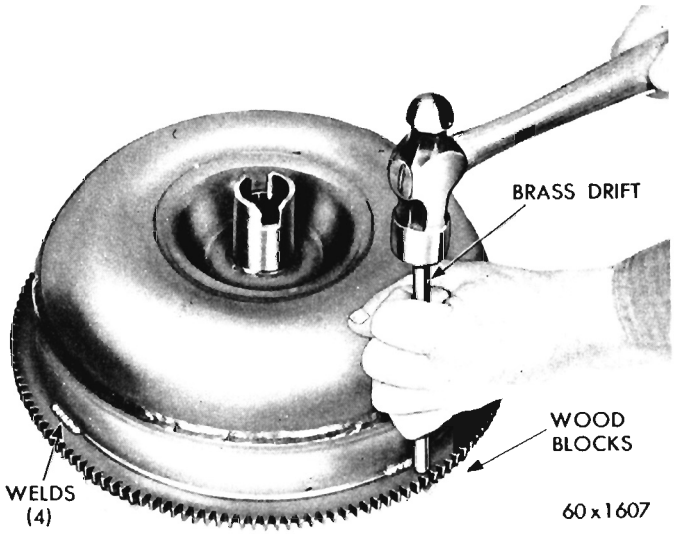


Fig. 110—Removing Starter Ring Gear

(2) Scribe a heavy line on the front cover next to the front face of the ring gear to aid in locating the new gear.

(3) Support the converter with the four lug faces resting on blocks of wood. **The converter must not rest on the front cover hub during this operation.** Using a blunt chisel or drift and hammer, tap downward on the ring gear near the welded areas to break any remaining weld material (Fig. 110). Tap around the ring gear until it comes off the converter.

(4) Smooth off the weld areas on the cover with a file.

Installing Ring Gear

Any of the following methods may be used to heat and expand the starter ring gear for installation on the converter:

Oven: Place the ring gear in Oven C-794 and set the temperature at 200 degrees F. Allow the ring gear to remain in the oven for 15 to 20 minutes.

Boiling Water: Place the ring gear in a shallow container, add water, and heat for approximately eight minutes after the water has come to a boil.

Steam: Place the ring gear on a flat surface and direct a steam flow around the gear for approximately two minutes.

Flame: Place the ring gear squarely on a flat surface. Using a medium size tip, direct a slow flame evenly around the inner rim of the gear. **Do not apply flame to the gear teeth.** Place a few drops of water on the face of gear at intervals during the heating process. When the gear is hot enough to just boil the water, installation of the gear on the torque converter can be made.

(1) After the ring gear is expanded by heating, place the gear in position on the converter front cover. Tap the gear on the cover evenly with a plastic or rawhide mallet until the face of the gear is even with the scribed line (made during removal) on the front cover. Make sure the gear is even with the scribed line around the full circumference of the front cover.

(2) Reweld the ring gear to the torque converter front cover, being careful to place, as nearly as possible, the same amount of weld material in exactly the same location as was used in the original weld. This is necessary in order to maintain proper balance of the unit. Place the welds alternately on opposite sides of the converter to minimize distortion.

(3) The following suggestions are offered as an aid in making the weld:

a. **Do not gas weld.**

b. Use a D.C. welder that is set at straight polarity or an A.C. welder if the proper electrode is available.

c. Use a ⅛ inch diameter welding rod, and a welding current of 80 to 125 amps.

d. Direct the arc at the intersection of the gear and front cover from an angle of 45 degrees from the rear face of the gear.

(4) Inspect the gear teeth and remove all nicks where metal is raised, weld metal splatter, etc., in order to ensure quiet starter operation.

2C—SERVICE DIAGNOSIS

NOTE: The transmission should not be removed nor disassembled until a careful diagnosis is made, the definite cause determined and all possible external corrections performed. In diagnosing any abnormal shift condition, always make the hydraulic pressures test before disassembly or replacement of parts.

TORQUEFLITE

Condition	Possible Cause	Correction
Harsh Engagement in D, 1, 2 and R	(a) Engine idle speed too high.	(a) Adjust the engine idle speed to 500 rpm. Readjust throttle linkage.
	(b) Hydraulic pressures too high or low.	(b) Check fluid level, then perform hydraulic pressure tests and adjust to specifications.
	(c) Low-reverse band out of adjustment.	(c) Adjust the low-reverse band.
	(d) Valve body malfunction or leakage.	(d) Perform pressure tests to determine cause and correct as required.
	(e) Accumulator sticking, broken rings or spring.	(e) Inspect the accumulator for sticking, broken rings or spring. Repair as required.
	(f) Low-reverse servo, band or linkage malfunction.	(f) Inspect the servo for damaged seals, binding. Repair as required.
	(g) Worn or faulty front and/or rear clutch.	(g) Disassemble and inspect clutch. Repair or replace as required.
Delayed Engagement in D, 1, 2 and R	(a) Low fluid level.	(a) Refill to correct level with Automatic Transmission Fluid Type A, Suffix A.
	(b) Incorrect control cable adjustment.	(b) Adjust the control cable.
	(c) Oil filter clogged.	(c) Replace the oil filter.
	(d) Hydraulic pressures too high or low.	(d) Perform the hydraulic pressure tests and adjust to specifications.
	(e) Valve body malfunction or leakage.	(e) Perform pressure tests to determine cause and correct as required.
	(f) Accumulator sticking, broken rings or spring.	(f) Inspect the accumulator for sticking, broken rings or spring. Repair as required.
	(g) Clutches or servos sticking or not operating.	(g) Remove the valve body assembly and perform air pressure tests. Repair as required.
	(h) Faulty front pump.	(h) Perform the hydraulic pressure tests. Adjust or repair as required.
	(i) Worn or faulty front and/or rear clutch.	(i) Disassemble and inspect clutch. Repair or replace as required.
	(j) Worn or broken input shaft and/or reaction shaft support seal rings.	(j) Inspect and replace the seal rings as required, also inspect respective bores for wear. Replace the parts as required.
	(k) Aerated fluid.	(k) Inspect for air leakage into the front pump suction passages.
Runaway or Harsh Unshift and 3-2 Kickdown	(a) Low fluid level.	(a) Refill to correct level with Automatic Transmission Fluid, Type A, Suffix A.
	(b) Incorrect throttle linkage adjustment.	(b) Adjust the throttle linkage.
	(c) Hydraulic pressures too high or low.	(c) Perform the hydraulic pressure tests and adjust to specifications.
	(d) Kickdown band out of adjustment.	(d) Adjust the kickdown band.
	(e) Valve body malfunction or leakage.	(e) Perform pressure tests to determine cause and correct as required.
	(f) Governor malfunction.	(f) Inspect the governor and repair as required.

SERVICE DIAGNOSIS—(Continued) TORQUEFLITE TRANSMISSION

Condition	Possible Cause	Correction
	(g) Accumulator sticking, broken rings or spring.	(g) Inspect the accumulator for sticking, broken rings or spring. Repair as required.
	(h) Clutches or servos sticking or not operating.	(h) Remove the valve body assembly and perform the air pressure tests. Repair as required.
	(i) Kickdown servo, band or linkage malfunction.	(i) Inspect the servo for sticking, broken seal rings, binding linkage or faulty band lining. Repair as required.
	(j) Worn or faulty front clutch.	(j) Disassemble and inspect clutch. Repair or replace as required.
	(k) Worn or broken input shaft and/or reaction shaft support seal rings.	(k) Inspect and replace seal rings as required, also inspect the respective bores for wear. Replace parts as required.
No Upshift	(a) Low fluid level.	(a) Refill to correct level with Automatic Transmission Fluid Type A, Suffix A.
	(b) Incorrect throttle linkage adjustment.	(b) Adjust the throttle linkage.
	(c) Kickdown band out of adjustment.	(c) Adjust the kickdown band.
	(d) Hydraulic pressures too high or low.	(d) Perform the hydraulic pressure tests and adjust to specifications.
	(e) Governor sticking.	(e) Remove and clean the governor. Replace if necessary.
	(f) Valve body malfunction or leakage.	(f) Perform pressure tests to determine cause and correct as required.
	(g) Accumulator sticking, broken rings or spring.	(g) Inspect accumulator for sticking, broken rings or spring. Repair as required.
	(h) Clutches or servos sticking or not operating.	(h) Remove the valve body assembly and perform the air pressure tests. Repair as required.
	(i) Faulty rear oil pump.	(i) Perform the hydraulic pressure test, adjust or repair as required.
	(j) Kickdown servo, band or linkage malfunction.	(j) Inspect the servo for sticking, broken seal rings, binding linkage or faulty band lining. Repair as required.
	(k) Worn or faulty front clutch.	(k) Disassemble and inspect clutch. Repair or replace as required.
	(l) Worn or broken input shaft and/or reaction shaft support seal rings.	(l) Inspect and replace the seal rings as required, also inspect the respective bores for wear. Replace parts as required.
No Kickdown or Normal Downshift	(a) Incorrect throttle linkage adjustment.	(a) Adjust the throttle linkage.
	(b) Incorrect control cable adjustment.	(b) Adjust the control cable.
	(c) Kickdown band out of adjustment.	(c) Adjust the kickdown band.
	(d) Hydraulic pressures too high or low.	(d) Perform the hydraulic pressure tests and adjust to specifications.
	(e) Governor sticking.	(e) Remove and clean the governor. Replace parts if necessary.
	(f) Valve body malfunction or leakage.	(f) Perform pressure tests to determine cause and correct as required.
	(g) Accumulator sticking, broken rings or spring.	(g) Inspect the accumulator for sticking, broken rings or spring. Repair as required.

SERVICE DIAGNOSIS—(Continued) TORQUEFLITE TRANSMISSION

Condition	Possible Cause	Correction
	(h) Clutches or servos sticking or not operating.	(h) Remove the valve body assembly and perform the air pressure tests. Repair as required.
	(i) Kickdown servo, band or linkage malfunction.	(i) Inspect the servo for sticking, broken seal rings, binding linkage or faulty band lining. Repair as required.
	(j) Overrunning clutch not holding.	(j) Disassemble the transmission and repair the overrunning clutch as required.
Shifts Erratic	(a) Low fluid level.	(a) Refill to the correct level with Automatic Transmission Fluid, Type "A", Suffix "A".
	(b) Aerated fluid.	(b) Inspect for air leakage into the front pump suction passages.
	(c) Incorrect throttle linkage adjustment.	(c) Adjust the throttle linkage.
	(d) Incorrect control cable adjustment.	(d) Adjust the control cable.
	(e) Hydraulic pressures too high or low.	(e) Perform the hydraulic pressure tests and adjust to specifications.
	(f) Governor sticking.	(f) Remove and clean the governor. Replace parts if necessary.
	(g) Oil filter clogged.	(g) Replace the oil filter.
	(h) Valve body malfunction or leakage.	(h) Perform pressure tests to determine cause and correct as required.
	(i) Clutches or servos sticking or not operating.	(i) Remove the valve body assembly and perform air pressure tests. Repair as required.
	(j) Faulty rear and/or front oil pump.	(j) Perform the hydraulic pressure tests, adjust or repair as required.
	(k) Worn or broken input shaft and/or reaction shaft support seal rings.	(k) Inspect and replace the seal rings as required, also inspect respective bores for wear. Replace the parts as required.
Slips in Forward Drive Positions	(a) Low fluid level.	(a) Refill to the correct level with Automatic Transmission Fluid, Type "A", Suffix "A".
	(b) Aerated fluid.	(b) Inspect for air leakage into the front pump suction passages.
	(c) Incorrect throttle linkage adjustment.	(c) Adjust the throttle linkage.
	(d) Incorrect control cable. adjustment.	(d) Adjust the control cable.
	(e) Hydraulic pressures too low.	(e) Perform the hydraulic pressure tests and adjust to specifications.
	(f) Valve body malfunction or leakage.	(f) Perform pressure tests to determine cause and correct as required.
	(g) Accumulator sticking, broken rings or spring.	(g) Inspect the accumulator for sticking, broken rings or spring. Repair as required.
	(h) Clutches or servos sticking or not operating.	(h) Remove the valve body assembly perform air pressure tests. Repair as required.
	(i) Worn or faulty front and/or rear clutch.	(i) Disassemble and inspect clutch. Repair or replace as required.
	(j) Overrunning clutch not holding.	(j) Disassemble the transmission and repair the overrunning clutch as required.
	(k) Worn or broken input shaft and/or reaction shaft support seal rings.	(k) Inspect and replace the seal rings as required, also inspect the respective bores for wear. Replace parts as required.

SERVICE DIAGNOSIS—(Continued) TORQUEFLITE TRANSMISSION

Condition	Possible Cause	Correction
Slips in Reverse Only	(a) Low fluid level.	(a) Refill to correct level with Automatic Transmission Fluid, Type "A", Suffix "A"
	(b) Aerated fluid.	(b) Inspect for air leakage into front pump suction passages.
	(c) Incorrect control cable adjustment.	(c) Adjust the control cable.
	(d) Hydraulic pressures too high or low.	(d) Perform the hydraulic pressure tests and adjust to specifications.
	(e) Low-reverse band out of adjustment.	(e) Adjust the low-reverse band.
	(f) Valve body malfunction or leakage.	(f) Perform pressure tests to determine cause and correct as required.
	(g) Front clutch or rear servo, sticking or not operating.	(g) Remove the valve body assembly and perform air pressure tests. Repair as necessary.
	(h) Low-reverse servo, band or linkage malfunction.	(h) Inspect the servo for damaged seals, binding linkage or faulty band lining. Repair as required.
	(i) Faulty front oil pump.	(i) Perform the hydraulic pressure tests, adjust or repair as required.
Slips in All Positions	(a) Low fluid level.	(a) Refill to the correct level with Automatic Transmission Fluid, Type "A", Suffix "A".
	(b) Hydraulic pressures too low.	(b) Perform the hydraulic pressure tests and adjust to specifications.
	(c) Valve body malfunction or leakage.	(c) Perform pressure tests to determine cause and correct as required.
	(d) Faulty front oil pump.	(d) Perform the hydraulic pressure tests, adjust or repair as required.
	(e) Clutches or servos sticking or not operating.	(e) Remove the valve body assembly and perform air pressure tests. Repair as required.
	(f) Worn or broken input shaft and/or reaction shaft support seal rings.	(f) Inspect and replace the seal rings as required, also inspect respective bores for wear. Replace the parts as required.
No Drive in Any Position	(a) Low fluid level.	(a) Refill to the correct level with Automatic Transmission Fluid, Type "A", Suffix "A".
	(b) Hydraulic pressures too low.	(b) Perform the hydraulic pressure tests and adjust to specifications.
	(c) Oil filter clogged.	(c) Replace the oil filter.
	(d) Valve body malfunction or leakage.	(d) Perform pressure tests to determine cause and correct as required.
	(e) Faulty front oil pump.	(e) Perform the hydraulic pressure tests, adjust or repair as required.
	(f) Clutches or servos sticking or not operating.	(f) Remove the valve body assembly and perform air pressure tests. Repair as required.
No Drive in Forward Drive Positions	(a) Hydraulic pressures too low.	(a) Perform the hydraulic pressure tests and adjust to specifications.
	(b) Valve body malfunction or leakage.	(b) Perform pressure tests to determine cause and correct as required.
	(c) Accumulator sticking, broken rings or spring.	(c) Inspect the accumulator for sticking, broken rings or springs. Repair as required.
	(d) Clutches or servos, sticking or not operating.	(d) Remove the valve body assembly perform air pressure tests. Repair as required.
	(e) Worn or faulty rear clutch.	(e) Disassemble and inspect clutch. Repair or replace as required.

SERVICE DIAGNOSIS—(Continued) TORQUEFLITE TRANSMISSION

Condition	Possible Cause	Correction
	(f) Overrunning clutch not holding.	(f) Disassemble the transmission and repair overrunning clutch as required.
	(g) Worn or broken input shaft and/or reaction shaft support seal rings.	(g) Inspect and replace the seal rings as required, also inspect the respective bores for wear. Replace parts as required.
No Drive in Reverse	(a) Incorrect control cable adjustment.	(a) Adjust the control cable.
	(b) Hydraulic pressures too low.	(b) Perform the hydraulic pressure tests and adjust to specifications.
	(c) Low-reverse band out of adjustment.	(c) Adjust the low-reverse band.
	(d) Valve body malfunction or leakage.	(d) Perform pressure tests to determine cause and correct as required.
	(e) Front clutch or rear servo, sticking or not operating.	(e) Remove the valve body assembly and perform air pressure tests. Repair as required.
	(f) Low-reverse servo, band or linkage malfunction.	(f) Inspect the servo for damaged seals, binding linkage or faulty band lining. Repair as required.
	(g) Worn or faulty front clutch.	(g) Disassemble and inspect clutch. Repair or replace as required.
Drives in Neutral	(a) Incorrect control cable adjustment.	(a) Adjust the control cable.
	(b) Valve body malfunction or leakage.	(b) Perform pressure tests to determine cause and correct as required.
	(c) Rear clutch inoperative.	(c) Inspect the clutch and repair as required.
Drags or Locks	(a) Kickdown band out of adjustment.	(a) Adjust the kickdown band.
	(b) Low-reverse band out of adjustment.	(b) Adjust the low-reverse band.
	(c) Kickdown and/or low-reverse servo, band, linkage malfunction.	(c) Inspect the servo for sticking, broken seal rings, binding linkage or faulty band lining. Repair as required.
	(d) Front and/or rear clutch faulty.	(d) Disassemble and inspect clutch. Repair or replace as required.
	(e) Planetary gear sets broken or seized.	(e) Inspect the condition of the planetary gear sets and replace as required.
	(f) Overrunning clutch worn, broken or seized.	(f) Inspect the condition of the overrunning clutch and replace parts as required.
Grating, Scraping or Growling Noise	(a) Kickdown band out of adjustment.	(a) Adjust the kickdown band.
	(b) Low-reverse band out of adjustment.	(b) Adjust the low-reverse band.
	(c) Output shaft bearing or bushing damaged.	(c) Remove the extension housing and replace the bearing or bushing.
	(d) Governor support binding or broken seal rings.	(d) Inspect the condition of the governor support and repair as required.
	(e) Front and/or rear oil pump scored or binding.	(e) Inspect the condition of the pump and repair as required.
	(f) Front and/or rear clutch faulty.	(f) Disassemble and inspect clutch. Repair or replace as required.
	(g) Planetary gear sets broken or seized.	(g) Inspect the condition of the planetary gear sets and replace as required.
	(h) Overrunning clutch worn, broken or seized.	(h) Inspect the condition of overrunning clutch and replace parts as required.

SERVICE DIAGNOSIS—(Continued) TORQUEFLITE TRANSMISSION

Condition	Possible Cause	Correction
Buzzing Noise	(a) Low fluid level.	(a) Refill to the correct level with Automatic Transmission Fluid, Type "A", Suffix "A".
	(b) Pumps sucking air.	(b) Inspect the pumps for nicks or burrs on mating surfaces, porous casting, and/or excessive rotor clearance. Replace the parts as required.
	(c) Valve body malfunction.	(c) Remove and recondition the valve body assembly.
	(d) Overrunning clutch inner race damaged.	(d) Inspect and repair the clutch as required.
Hard to Fill, Oil Flows out Filler Tube	(a) High fluid level.	(a) Drain the fluid to the correct level.
	(b) Breather clogged.	(b) Inspect and clean breather vent opening in front pump housing.
	(c) Oil filter clogged.	(c) Replace the oil filter.
	(d) Aerated fluid.	(d) Inspect for air leakage into front pump suction passages.
Transmission Overheats	(a) Low fluid level.	(a) Refill to the correct level with Automatic Transmission Fluid, Type "A", Suffix "A".
	(b) Kickdown band adjustment too tight.	(b) Adjust the kickdown band.
	(c) Low-reverse band adjustment too tight.	(c) Adjust the low-reverse band.
	(d) Faulty cooling system.	(d) Inspect the transmission cooling system, clean and repair as required.
	(e) Faulty rear and/or front oil pump.	(e) Inspect the oil pump for incorrect clearance, repair as required.
	(f) Insufficient clutch plate clearance in front and/or rear clutches.	(f) Measure the clutch plate clearance and correct with the proper size snap ring.
Impossible to Push Start	(a) Low fluid level.	(a) Refill to the correct level with Automatic Transmission Fluid, Type "A", Suffix "A".
	(b) Low-reverse band slipping.	(b) Adjust the low-reverse band.
	(c) Valve body malfunction or leakage.	(c) Remove and recondition the valve body assembly.
	(d) Rear oil pump faulty.	(d) Inspect and repair the rear oil pump as required.
	(e) Low-reverse servo, band or linkage malfunction.	(e) Inspect the servo for damaged seals, binding linkage or faulty band lining. Repair as required.
	(f) Worn or faulty rear clutch.	(f) Disassemble and inspect clutch. Repair or replace as required.
	(g) Worn or broken input shaft and/or reaction shaft support seal rings.	(g) Inspect and replace the seal rings as required, also inspect respective bores for wear. Replace the parts as required.
Starter Will Not Energize in Neutral	(a) Incorrect control cable adjustment.	(a) Adjust the control cable.
	(b) Faulty or incorrectly adjusted neutral starting switch.	(b) Test the operation of the switch with a test lamp. Adjust or replace as required.
	(c) Broken lead to neutral switch.	(c) Inspect the lead and test with a test lamp. Repair the broken lead.

GROUP 22

WHEELS, BEARINGS AND TIRES

CONTENTS

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SPECIFICATIONS

	Plymouth VP-2 8 Cyl.	Plymouth VP-1 6 Cyl.	Plymouth VP-1, VP-2 Station Wagon	Valiant VV-1 All Models
WHEELS				
Type		Steel Disc		
Rim		Drop Center-Safety Rim		
Size—Std.	14 x 5K	14 x 5K	14 x 5½K	13 x 14½J
Size—Special	14 x 5½K**	14 x 5½K**	—	N/A
	15 x 5½K***	15 x 5½K***	15 x 5½K***	N/A
No. of Wheel Bolts	5	5	5	5
Stud Hole Circle	4½"	4½"	4½"	4"
Stud Size	½"-20	½"-20	½"-20	7/16"-20
Wheel Nut Torque	65 ft.-lbs.	65 ft.-lbs.	65 ft.-lbs.	55 ft.-lbs.
TIRES				
Type		Super Cushion—Tubeless		
Size—Std.	7.00-14	7.00-14	7.00-14	6.50-13
Ply	2	2	4	2
Size—Special	7.50-14	7.50-14	7.50-14	N/A
	6.70-15***	6.70-15***	6.70-15***	N/A
TIRE PRESSURE—COLD				
Pounds—Rear	22	22	26*	24*
Front	24	22	24****	24

*Increase Station Wagon rear tire pressure 4 pounds when fully loaded.
**14 x 5½K rim used with 11 inch brakes.
***6.70-15 tires use 24 pounds pressure front and rear.
****22 pounds 6-Cyl Sedans and Station Wagons.

TOOL LIST

C-3339	Dial Indicator
C-3455A	Tire Bead Breaker

WHEELS, BEARINGS AND TIRES

The safety rim wheel has raised sections between the rim flanges and the rim well (Fig. 1). Initial inflation of the tire forces the beads over these raised sections. In case of a blowout, the raised sections tend to hold the tire in position on the wheel, thus permitting control of the vehicle until it can be brought to a safe stop.

Tubeless tires have a uniformly smooth bead contact area in order to form an air seal with the wheel rim. Any foreign matter, accidentally forced between the tire bead and rim, may cause an immediate air leak or the formation of rust which would eventually cause an air leak.

SERVICE PROCEDURES

1. CARE OF TIRES

A protective, water-soluble coating is applied to the white sidewalls of tires at the factory. Wash the sidewalls with water only, to remove this coating. **DO NOT USE GASOLINE OR OTHER SOLVENTS. DO NOT USE A WIRE BRUSH.**

After the vehicle is in service, the whitewalls should be cleaned with soap or non-abrasive cleaners and (if necessary) a soft bristle brush.

Test the tire pressures regularly, including the spare when the tires are cool or cold. Inflate to the specified pressures and inspect for damage and embedded foreign matter at the same time.

2. TIRE ROTATION

With increased road speeds and faster cornering, abnormal tire wear may exist on certain wheels. By rotating tires regularly, the tire life will be lengthened. Spare tires age and deteriorate almost as much as tires in use, therefore, the rotation plan (Fig. 2) should be followed to obtain maximum life of all tires.

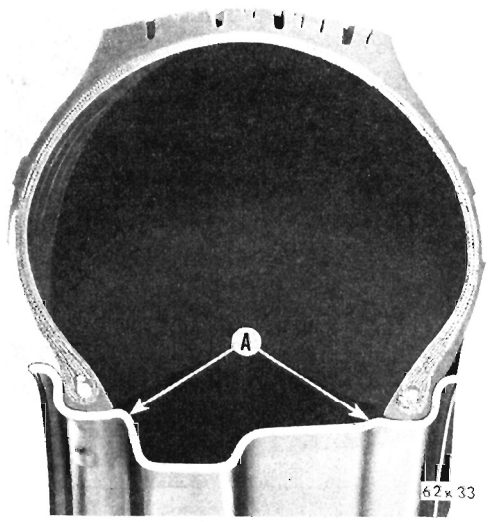


Fig. 1—Safety Type Rim

3. MEASURING WHEEL AND TIRE RUNOUT

Wheels and tires may be measured for both radial and lateral runout. Radial runout is the difference between the high and low points on the treads of the tire; while, lateral runout is the "wobble of the wheel and/or tire.

Prior to measuring the wheel and tires for runout, the face of the hub at the mounting bolts should be inspected for runout. The hub should be free to rotate but tight enough to prevent wobble. The vehicle should be driven a short distance before the measurement is made so that "flat-spotting" of the tire (from being parked) does not affect the runout measurement.

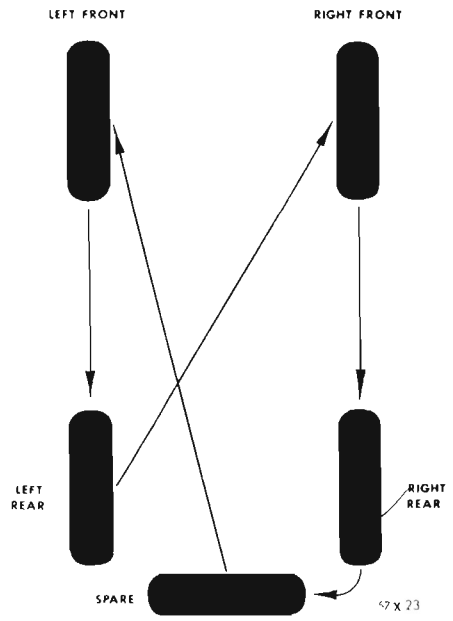


Fig. 2—Tire Rotation

(1) Attach the dial indicator Tool C-3339 to a firm base so it will be held steady while taking the runout readings.

(2) Place the plunger of the dial indicator against one of the center ribs of the tire tread and rotate the wheel slowly to measure the radial runout. This measurement should not exceed .060 inch.

(3) To measure the lateral runout (wobble), position the dial indicator against the side of the tire. This measurement should not exceed .080 inch.

Rotating the tire on the wheel may reduce the runout or it may be necessary to take dial indicator measurements of the wheel itself in order to determine which unit has the excessive runout. Since the exterior surfaces of the wheel rim may have paint runs or bubbles, scratches or other imperfections, it is better to dial indicate the protected areas "A" and "B", Figure 3. The radial runout, "A", should not exceed .050 inch. The lateral runout (wobble), "B", should not exceed .050 inch.

NOTE: Under no circumstances should point "C" (Fig. 3) be used for measuring the runout as this metal has been sheared in the manufacturing process and is not an even surface.

4. WHEEL BALANCE

The necessity for balancing wheels is indicated by heavy vibration of the steering wheel of the car, when driving at speeds above 40 miles an hour over a smooth straight highway.

Static (still) balance is equal distribution of the weight of the wheel and tire around the spindle, in such a manner that the wheel assembly has no tendency to rotate by itself, regardless of its position. A wheel that has a heavy spot is statically out of balance, resulting in a "hopping" or bouncing action.

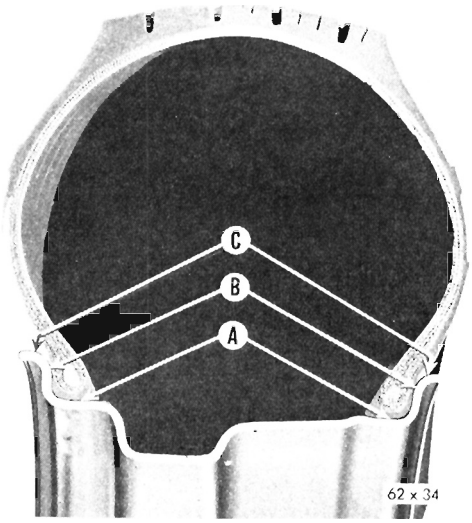


Fig.3—Runout Checking Areas

A wheel and tire, to be in dynamic balance, must first be in static balance and also be in balance from side to side when the wheel is at right angles to the axis of rotation. A wheel not in dynamic balance tends to wobble or shimmy.

Correction for static unbalance is made by first finding the location of the heavy spot, then adding sufficient weight to counterbalance it at a location opposite the heavy section. Follow the equipment manufacturers recommendations.

The total weight to be added should be divided in half and the weights placed on the inside and outside rim edges.

5. REPAIRING LEAKS

In case of slow air leakage, the puncturing object may be seen or the escaping air can be heard. At times, it may be necessary to apply a soapy water solution to the tire or to submerge the tire and rim in water in order to locate the leak.

Leaks, between the tire and wheel, require the removal of the tire. Leaks in the tire can often be repaired without removing the tire. Always follow the equipment manufacturers recommendations.

6. DISMOUNTING AND MOUNTING TIRES

Tools used for dismounting and mounting tires must be smooth, free from sharp edged or projections which could damage the tire, or tire rim.

Removal

(1) Remove the valve core and completely deflate the tire.

(2) Carefully force both tire beads over the safety raised rim section, into the drop-center section.

Tire bead breaker, Tool C-3455A may be used to

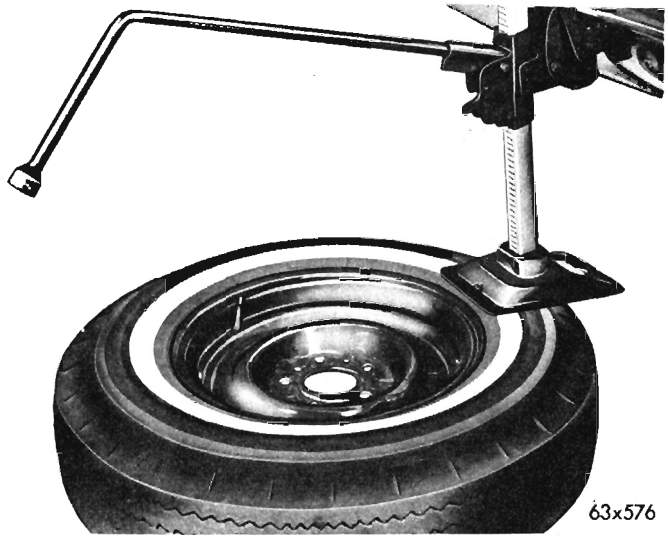


Fig. 4—Removing Tire With Car Jack

force the tire beads over the raised rim section, however, the car jack may be used as an alternate method. (See Fig. 4.)

(3) While holding one bead in the center section, pry the other bead off the wheel. Then remove the remaining bead to complete the removal.

Cleaning and Inspection

(1) Remove all rust inside the wheel rim and any roughness on the butt weld in the tire contact area.

(2) The sealing areas of both tire beads must be smooth and uniform.

Installation

(1) Apply a mild soap and water solution to both tire beads.

(2) Place one bead over the rim of the wheel, working the entire bead into the low section of the rim.

(3) Place the other bead over the wheel rim and work the entire bead into the low section of the rim.

(4) While applying air through the valve stem, strike the tread sharply with a rubber hammer to force both beads outward over the raised rim section. It may be necessary to use bead expander Tool C-3440 (Fig. 5) or a rope tourniquet (Fig. 6).

(5) When both tire beads are fully seated, install the valve core and inflate the tire to the recommended pressure.

7. FRONT WHEEL BEARINGS

The front wheel bearings should be cleaned and repacked with Wheel Bearing or Automotive Multipurpose Lubricating Grease whenever brake linings are replaced or the brake drums resurfaced. All the old lubricant should be cleaned thoroughly from the bearings and the wheel hubs and the bearings repacked with the new grease; the annular groove of the wheel inner hubs should be filled with the lubricant.

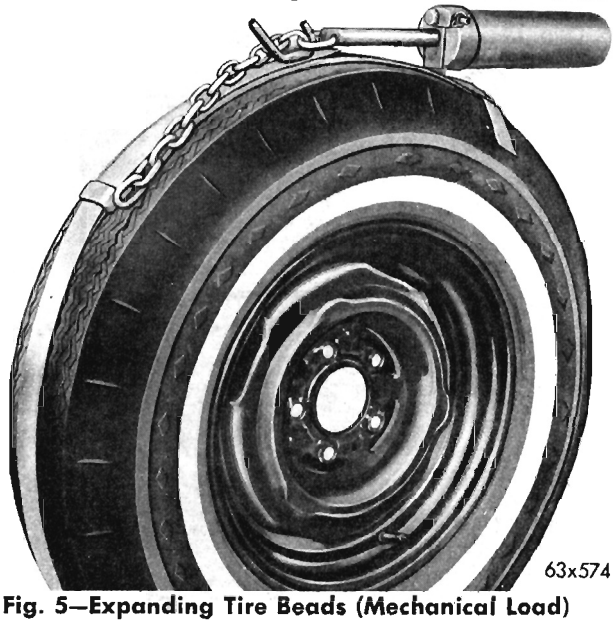


Fig. 5—Expanding Tire Beads (Mechanical Load)

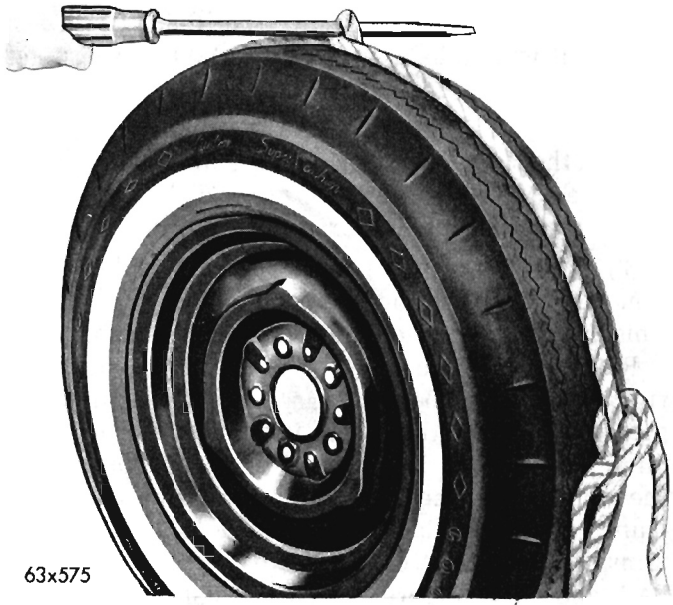


Fig. 6—Expanding Tire Beads (Rope Tourniquet)

At other times, the lubricant in the bearings should be inspected whenever the wheels are removed to inspect or service the brake system. Do not repack the bearings if the grease is adequate in quantity and quality. If the grease either is low in quantity, contains dirt, or has been contaminated with water to produce a milky appearance, the bearings and hubs should be cleaned and repacked as described in the preceding paragraph. DO NOT ADD GREASE TO THE WHEEL BEARINGS - RELUBRICATE COMPLETELY.

Removal

(1) Raise the vehicle so the front wheels are free of the floor.

(2) Remove the wheel cover, grease cup, cotter pin and bearing adjusting nut.

(3) Remove the thrust washer and outer bearing from the hub.

(4) Slide the wheel, hub and drum assembly off the spindle.

(5) Drive out the inner oil seal and remove the bearing cone.

Cleaning and Inspection

(1) Clean the hub and drum assembly and the

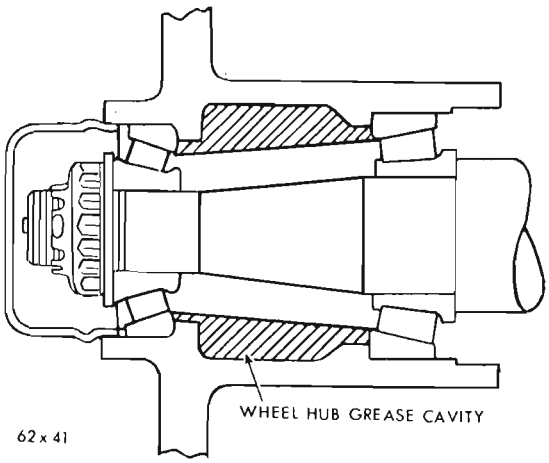


Fig. 7—Wheel Hub Grease Cavity

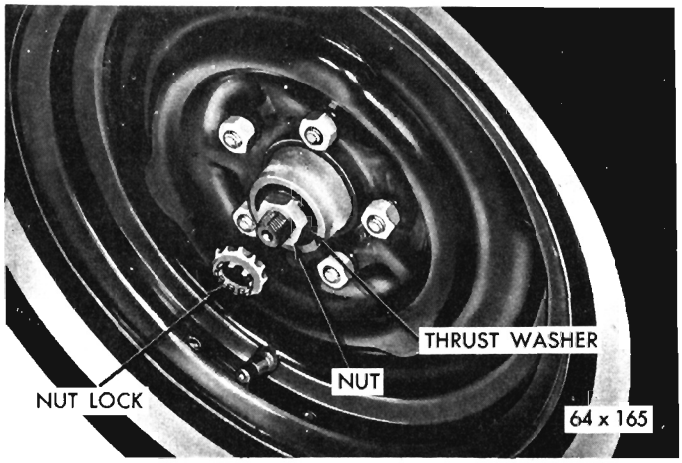


Fig. 8—Adjusting Front Wheel Bearings

bearings in kerosene, mineral spirits or other similar cleaning fluids. **Do not spin dry the bearings.**

(2) Examine the bearing cups for pits, brinell marks or other imperfections. If cups are damaged, remove them from the hub using a soft steel drift positioned in the slots in the hub.

(3) The bearing cup areas in the hub should be smooth, without scored or raised metal which could keep the cups from seating against the shoulders in the hub.

(4) The cones and rollers should have smooth, unbroken surfaces without brinell marks. The ends of the rollers and both cone flanges should also be smooth and free from chipping or other damage.

Installation

(1) If the bearing cups were removed, start the new cups into the hub evenly, driving them flush with the hub, using a soft steel block and hammer. Seat the cups against the shoulders in the hub, using a soft steel drift and hammer.

(2) Fill the hub cavity with the recommended wheel bearing lubricant, as shown in Figure 7. The lubricant should be even with the inner diameter of the bearing cups.

(3) Force the lubricant between the bearing cone rollers or repack with a "bearing packer" tool.

(4) Install the cone and a new oil seal with the lip of the seal facing inward. Use a wood block to drive the seal flush with the end of the hub on all Valiant Models. Use Tool C-3893 to install the seal on all Plymouth Models. The seal flange may be damaged if the tool is not used.

(5) Clean the spindle and install the wheel, tire and drum assembly.

(6) Install the outer bearing cone, thrust washer and adjusting nut.

Adjustments

(1) Tighten the wheel bearing adjusting nut to 70 inch-pounds torque (Valiant models) 90 inch-pounds torque (Plymouth models), while rotating the wheel.

(2) Position the nut lock on the adjusting nut so one pair of cotter pin slots aligns with the pin hole in the spindle (Fig. 8).

(3) Back off the adjusting and nut lock assembly one slot and install the cotter pin. **The resulting adjustment should be zero (no preload) to .003" end play.**

(4) Clean the grease cap, coat the inside with wheel bearing lubricant (do not fill) and install the cap.

(5) Install the wheel covers and lower the vehicle to the floor.

8. TIRE WEAR PATTERNS

For the various tire wear patterns, refer to Figures 9 through 13.

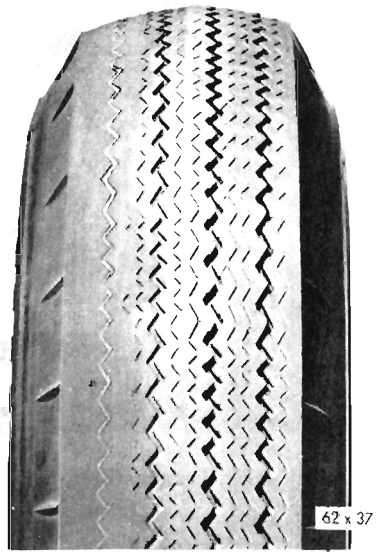


Fig. 9—Camber Wear



Fig. 11—Over Inflation Wear

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
Side Wear (Figs. 9 and 10)	(a) Outside (all wheels) excessive cornering speed.	(a) Driver instructions.
	(b) Outside (front) excessive positive camber.	(b) Adjust camber to specifications.
	(c) Inside (front) excessive negative camber.	(c) Adjust camber to specifications.
	(d) Outside and inside-under inflation or vehicle overload.	(d) Inflate tires (when cool) to specified pressure and test vehicle for overload.
Center Ribs Wear (Fig. 11)	(a) Over-inflation.	(a) Adjust tire pressure to specifications (when tires are cool).

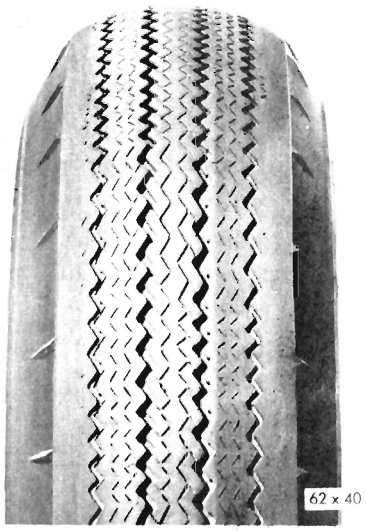


Fig. 10—Under Inflation Wear

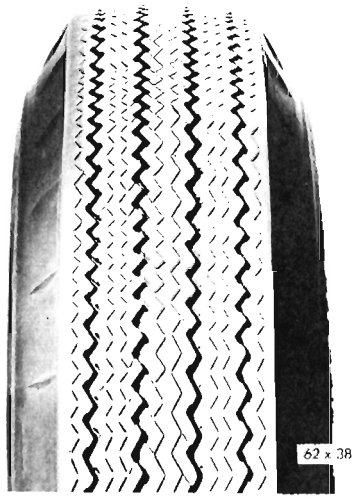


Fig. 12—Toe Wear

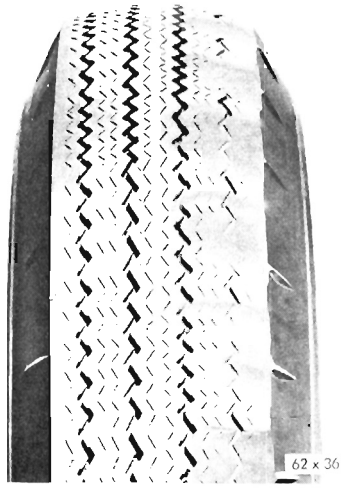


Fig. 13—Spotty Wear

SERVICE DIAGNOSIS—(Continued)

Condition	Possible Cause	Correction
Sharp Rib Edges (Fig. 12)	(a) Inside edges-excessive toe-in.	(a) Adjust toe-in to specifications.
	(b) Outside edges-excessive toe-out.	(b) Adjust toe-in to specifications.
	(c) One tire sharp inside, opposite tire sharp outside-bent arm or knuckle.	(c) Inspect for bent arm or knuckle, replace parts as required.
Abrasive Roughness Across Tread	(a) Excessive cornering speed.	(a) Driver instructions.
Heel and Toe Wear	(a) High accelerations (Hot Rodding)	(a) Driver instructions.
	(b) Severe use of brakes.	(b) Driver instructions.
Uniform Spotty Wear (Fig. 13)	(a) Lack of tire rotation.	(a) Rotate tires.
	(b) Tires and wheels out of balance.	(b) Balance and rotate assemblies.
Irregular Spotty Wear	(a) Tires and wheels out of balance.	(a) Balance and rotate assemblies.
	(b) Under-inflation.	(b) Inflate tires to specified pressure (when cool).
	(c) Loose or worn parts.	(c) Inspect front suspension for worn parts replace as required.

GROUP 23
BODY AND SHEET METAL

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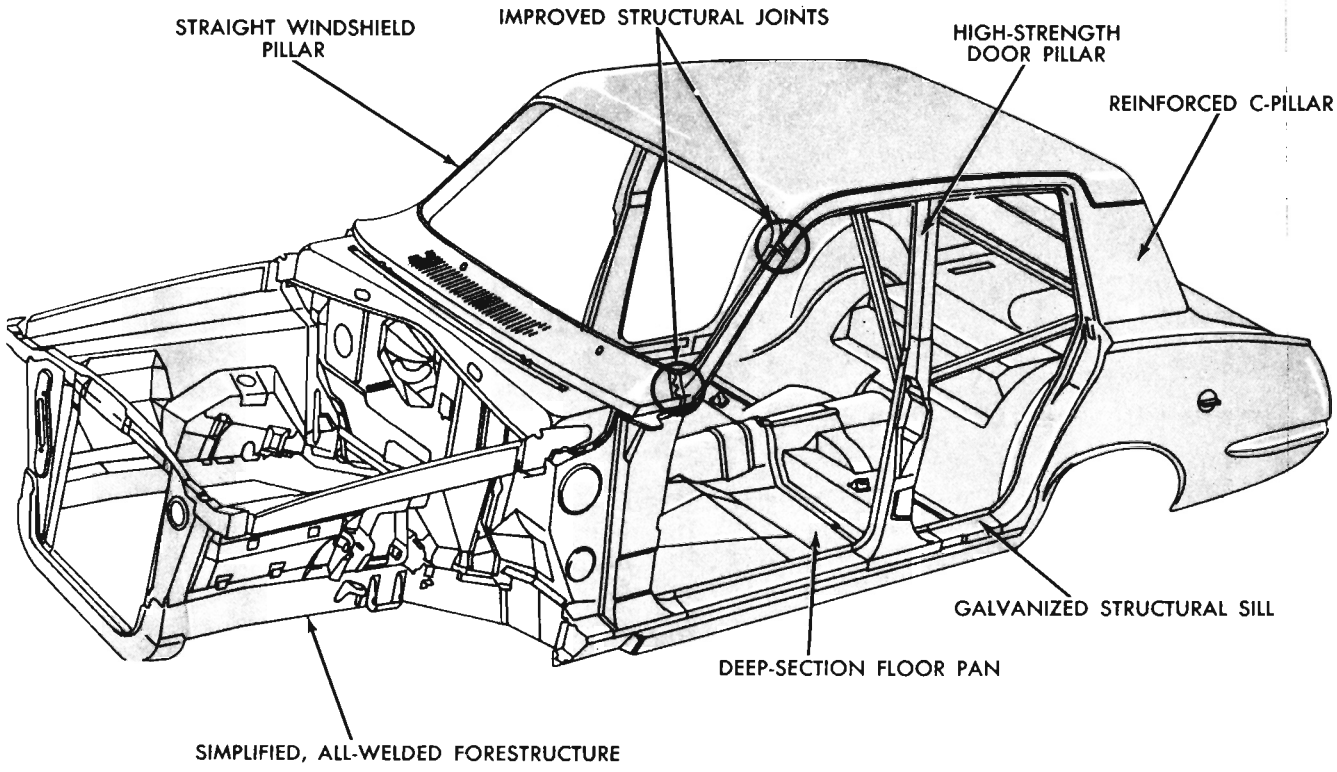


Fig. 1—Unit Body Construction

BODY AND SHEET METAL

PART 1—BODY MAINTENANCE

The body and frame (Fig. 1) are combined into a welded and reinforced shell of exceptional strength and twist resistance. Sturdy reinforcements are used throughout the lower body structure to carry driving, braking and suspension loads. They are formed of heavy box sections which distributes the major road forces to broad areas of the body structure. The box sections also provide solid supports for the bumpers, springs and shock absorbers.

All door pillars, sills, roof rails, windshield headers, and belt line rails are fully boxed to provide maximum strength. The heavy gauge front fender side shield are welded to the dash panel, side sills, and radiator yoke to form a rigid front end structure. The side shields also protect the engine from road splash. The deck lid and hood are reinforced for greater strength, rigidity and twist resistance. More than 5300 spot welds and seam welds are used to join the many steel stampings which make up the body structure. Two structural members are bolted in place, one is the K-shaped engine support crossmember, and the other is the short member which supports the transmission. The front fenders and grilles are attached with bolts which provides ease and low cost in replacement.

The bodies are subjected to a very intensive seven stage immersion anti-corrosion and a rustproofing process.

1. INTERIOR UPHOLSTERY CLEANING

Most stains can be removed quite easily from fabrics while they are fresh and have not hardened and set into the fabric. An exception is mud or clay, which should be allowed to dry so that most of it can be brushed off. It is also very helpful, though often not possible, to know the nature of the staining matter so that the proper solvent may be used. Most common stains can be removed either with a dry cleaning solvent, such as kar-kleen, fabric cleaner or carbon tetrachloride cleaning fluid, or with water solution containing one-half of 1% of a laundry-type detergent. Thus, if the nature of the staining matter can only be guessed at and a dry cleaning fluid does not remove the stain, it should then be cleaned with a one-half of 1% solution of a detergent in water, or vice-versa.

When using a detergent, do not use one containing a bleach as this could discolor the fabric. Most detergents contain a certain amount of bleach, caution should be exercised as to the amount used.

Some of the more common upholstery stains can be removed as follows:

Candy, Chocolate or Ice Cream Stains. Scrape off as much of the staining matter as possible with a dull knife. Clean with one-half of 1% solution of laundry-type detergent in warm water.

General Instructions: Use a piece of **Clean** cotton cheese cloth approximately 3″ x 3″. Squeeze most of the liquid from the fabric and it is less likely to leave a ring. Wipe the soiled fabric very lightly with a lifting motion. Always work from the outside toward the center of the spot. Turn the cheese cloth over as soon as one side becomes stained to prevent working the staining matter back into the cleaned portion of the fabric. Use a new piece of cheese cloth as soon as both sides become stained.

Grease, Oil or Tar Stains. Scrape off as much of the staining matter as possible with a dull knife. Clean the fabric using the recommended cleaner. Be sure the manufacturers instructions are as followed. Follow General Instructions as listed above.

If grease, oil or tar stains cannot be removed satisfactorily with fabric cleaner on a certain type of fabric, use carbon tetrachloride cleaning fluid. The same procedure can be followed as with fabric cleaner.

CAUTION: Carbon tetrachloride is very toxic to breathe. Since fabric cleaner contains a large portion of carbon tetrachloride, adequate ventilation must be provided when either of these cleaning fluids are used. A fan should be set to blow directly across the area in which the cleaning is done. To prevent skin cracking from the use of those cleaning fluids, apply a lanolin type skin cream to the hands after using the cleaning fluids.

Lipstick or Rouge Stains. First work white vaseline into the staining matter to loosen it. Then clean with fabric cleaner or carbon tetrachloride cleaning fluid as recommended.

Mud or Clay. Allow the mud or clay to dry completely. Then, brush it off with a soft bristled brush.

Clean with one-half of 1% solution of detergent in water.

When cleaning by any of the methods outlined above, never squeeze the liquid from the cleaning cloth back into the container of cleaning fluid, and never dip the cleaning cloth back into the container of cleaning fluid after the cloth has contacted the stain. Be sure that the cleaning fluid has no impurities and is not discolored before using it. If particles of the staining matter become locked between the fibres of the fabric, it may be necessary to use a clean soft bristled brush instead of the cheese cloth with the cleaning fluid.

2. CLEANING VINYL TRIM

The following are recommendations for cleaning plastic trim:

Grease, Oil or Tar Stains. These stains should be cleaned as soon as possible or they will migrate into the plastic and leave a permanent discoloration on the plastic surface. These stains should be cleaned with either fabric cleaner or Kar-Kleen, as recommended above.

The stain gained vinyl should be cleaned as soon as it appears to be getting dirty. Otherwise the dirt particles will get rubbed into the small grain crevices and be almost impossible to remove. The dirty vinyl trim should be cleaned with a piece of clean cotton cheese cloth dipped in a sudsy solution of a non-alkaline detergent in water. If the vinyl plastic trim still does not clean up, a clean brush with many fairly stiff bristles should be used in place of the cheese cloth.

3. REMOVAL OF DIRT FROM IVORY PLASTIC TRIM PANELS

The ivory plastic trim should be cleaned in the same manner as other vinyl interior trim, however, if the dirt has been rubbed into the grain so that it is not possible to remove with the detergent solution, a cleaner may be used. Any abrasive cleaning material will cause the material to peel. To clean, use plain water or water with a mild soap solution.

4. CARE AND CLEANING OF CONVERTIBLE COUPE TOP

Frequent brushing and vacuuming will keep the top free of abrasive dust and dirt. Wash top with warm water and mild soap, lathering well with a soft cloth or sponge. Rinse with plenty of clean water to remove all traces of soap. Allow to dry completely before lowering.

5. REAR WINDOW (Convertible Coupe)

The rear window is made from flexible vinyl plastic material and special attention should be given to cleaning and storage of the window. To clean the window, rinse with a cold water spray to remove grit and dirt. Lather the surface with suds of a mild soap using the palm of the hand. Rinse thoroughly and allow to air dry. Do not use a towel, sponge, or chamois to apply suds or to dry the window. Otherwise, the surface may be come scratched. If this procedure does not clean the window thoroughly, a solution of 40 per cent rubbing alcohol and 60 per cent clean water should be used. Apply with palm of hand and rub surface of window with a circular motion. Use solution generously.

PART 2
BODY ADJUSTMENT

6. FITTING AND ALIGNMENT

The appearance and weather sealing of all moveable parts of the body assembly are controlled by built in adjustments that permit the fit and alignment of hood, front fenders, doors, movable glass, deck lid and bumper face bars.

In fitting and aligning these movable parts, a definite sequence of alignment should be followed to insure the best in appearance and weather sealing. It is best to start with hood to body cowl alignment, hood to front fender and grille alignment, front fender to body cowl, front door to body and front fender to body cowl, front door to body and front fender, rear door to body opening, front door glass to rear door glass (hardtop models), deck lid to body, front and rear bumper face bar alignment.

7. HOOD ALIGNMENT

Plymouth

The hood is attached to the cowl panel through two counterbalanced hinges (Fig. 2). The attaching bolt holes of the hinges are oversize, permitting movement of both the hinge and the hood panel.

Prior to making any hood adjustments inspect and note clearances and alignment of all sides of the hood in relation to the cowl, fenders and grille. The cowl adjustment must be made first.

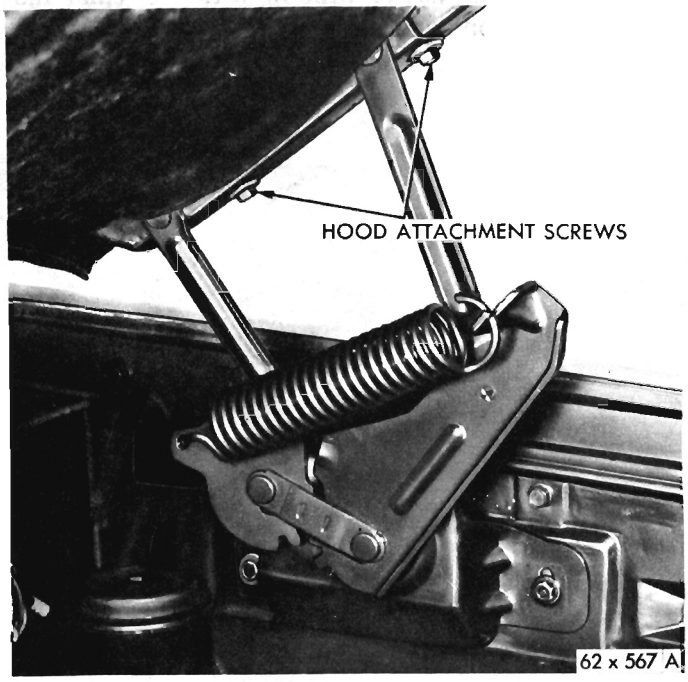


Fig. 2—Hood Hinge Adjustments (Plymouth)

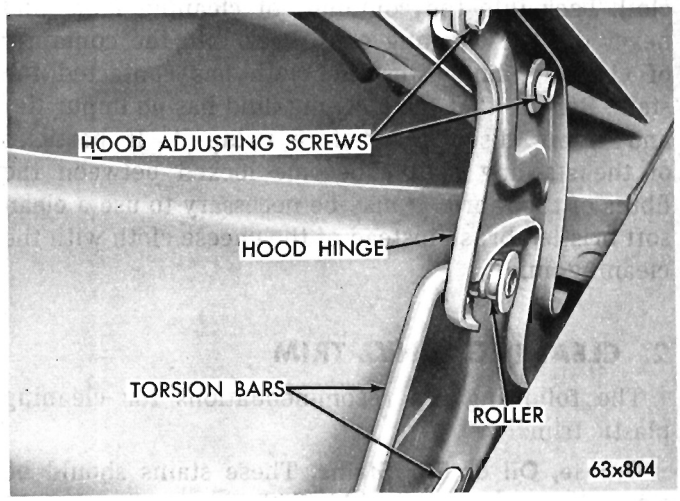


Fig. 3—Hood Hinge Adjustments (Valiant)

Valiant

The hood is counterbalanced by two torsion bars extending across the front of the cowl panel (Fig. 3). The hood is adjusted by means of oversize holes in the hinge arm.

Hood to Cowl (Plymouth and Valiant)

(1) Inspect the cowl alignment for tightness, looseness, uneven gap and high or low elevation at the corners.

(2) Prior to adjustment, scribe the hinge position on the hood.

(3) Loosen the hood attaching bolts (Figs. 2 and 3) and move the hood to the desired position to correct the alignment at the cowl.

(4) Tighten the attaching bolts to 180 inch-pounds torque.

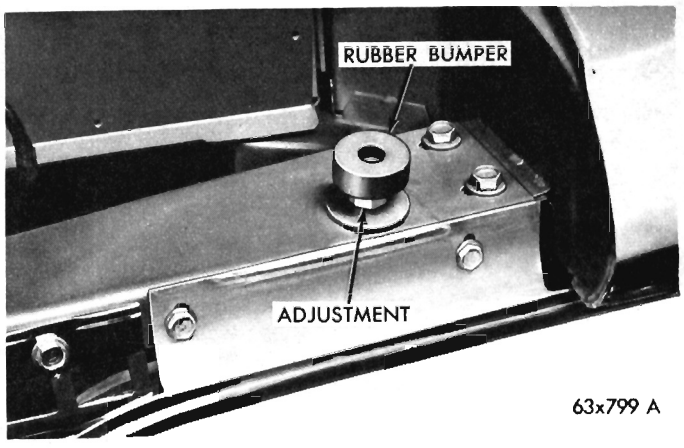


Fig. 4—Hood Leveling Adjustment

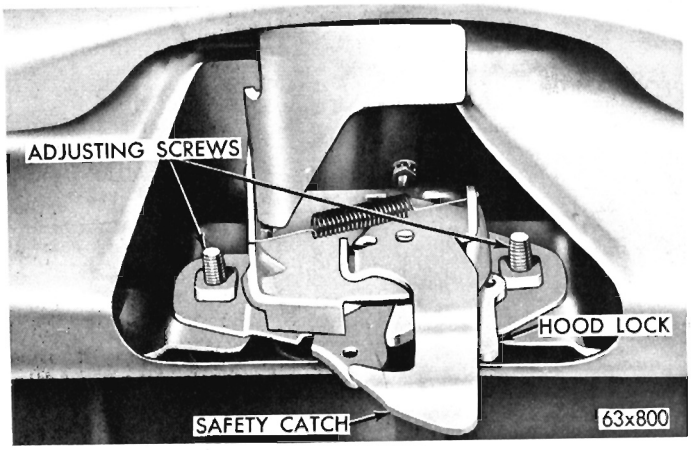


Fig. 5—Hood Lock Assembly (Plymouth)

(5) Reinstall the hood and cowl alignment.

(6) If corners of the hood are found to be high or low in relation to the cowl panel, scribe the hinge location on the cowl panel (Plymouth only).

(7) Loosen the hinge attaching bolts (Figs. 2 and 3) and raise or lower the hinge.

(8) (After step 7, if the rear of the hood and fender are not flush, it will be necessary to reset the fender to align with the cowl and hood.)

Hood to Fender (Plymouth and Valiant)

After completing the hood to cowl alignment, inspect the front of hood to fender clearance. The height of the hood to fender can be adjusted by removing the hood bumper (Fig. 4), and turning the adjusting screw in or out. It may be also necessary to loosen the fender attaching bolts and move the fender up or down to the desired position.

Hood to Grille (Plymouth and Valiant)

The height of the hood to grille clearance may be adjusted by lengthening or shortening the hood support studs (Fig. 4). The mounting of the hood lock is adjustable to insure alignment with the hood striker (Figs. 5 and 6).

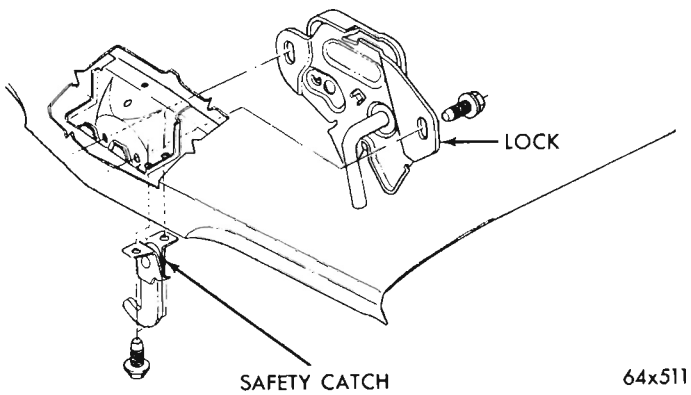


Fig. 6—Hood Lock Assembly (Valiant)

Unequal Spacing Between Rear of Hood and Fenders (Plymouth and Valiant)

(1) Loosen the hinge to hood attaching bolts on each side of the hood.

(2) Shift the hood (at rear) in the direction of the wide space, until spacing appears to be equal on each side.

(3) Tighten the hinge to the hood bolts, lower hood and inspect for correct fit.

If the spacing is correct on one side but too little or too much on the other side, loosen the bolts attaching the hood to hinge on the side to be adjusted. If the hood needs to be moved out, insert a large screw driver between the upper hinge plate and the hood flange. Force the hood out as required while holding pressure on the screw driver, and tighten the bolts securely.

To move the hood in, apply pressure on the outside edge of the hood, then tighten bolts securely. Lower the hood and inspect the hood for proper fit.

Fender Below Level of Hood

If the hood has been properly adjusted and one fender is still below the level of the hood at the front, the fender should be raised.

(1) Raise the hood, then loosen the bolts that hold the fender to the radiator support.

(2) Place a wood block or cloth pad on the lifting pad of the service jack and install under the front lower corner of the fender.

(3) Raise the jack slowly until the fender is in alignment. Leave the jack in place and tighten the fender bolts securely.

(4) Lower the jack, close the hood and inspect the fit.

(5) Adjust the hood bumpers as required.

Adjustment of the Hood Striker and Lock Assembly

The hood striker is mounted between the grille support and the radiator core support. The hood latch is mounted on the forward edge of the hood and oversize attaching holes permit alignment of the hood (Figs. 5 and 6).

8. FENDER ALIGNMENT

Gap Between the Rear Edge of the Fender and Sill Panel—Spacing Correct at Upper Section

Loosen the bottom fender to cowl attaching bolts. Place a 2 x 4 board between the tire and the fender. Protect the edge of the fender with a cloth pad. Pry the fender back to close the gap then retighten the attaching bolts.

Fender too Far Forward at Upper Door Opening

Loosen the fender-to-cowl attaching bolts. Apply pressure to the forward section of the fender until the correct alignment is obtained. Then tighten the fender-to-cowl attaching bolts.

9. DOOR ALIGNMENT

Make a thorough inspection of the door before attempting adjustment. A properly fitted door has evenly spaced gaps on all sides.

Test the engagement of the door latch with the striker plate. If the door raises as the latch passes over the plate, the plate is too high and must be lowered. The striker plate shown in Figure 7 can be moved "**In**" or "**Out**" and controls the tightness of the door against the body. The "**Up**" and "**Down**" adjustment will determine the actual point of engagement between the door lock rotor and the lower portion of the striker plate.

After the door has been fitted properly to the opening, adjust the striker plate as necessary.

To Raise or Lower the Door (Front Doors) (Fig. 8)

To raise or lower the door, remove the kick panel. Then, place the jack under the door as near the hinge as possible. (This will hold the weight of the door as hinge bolts are loosened.)

(1) Scribe a line around the upper and lower hinge strap.

(2) Loosen the upper and lower hinge strap bolts. The amount of vertical movement in the door is limited; however, the amount of movement can be determined by the scribed line previously made. Raise or lower the jack until the desired clearance is obtained then tighten the hinge bolts securely. **Inspect the scribe lines to make certain the rear portion of the door did not move forward or rearward during the above operation.**

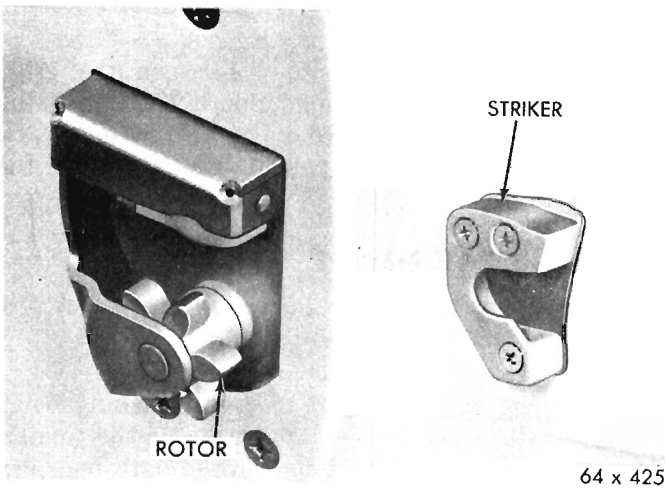


Fig. 7—Door Striker and Rotor

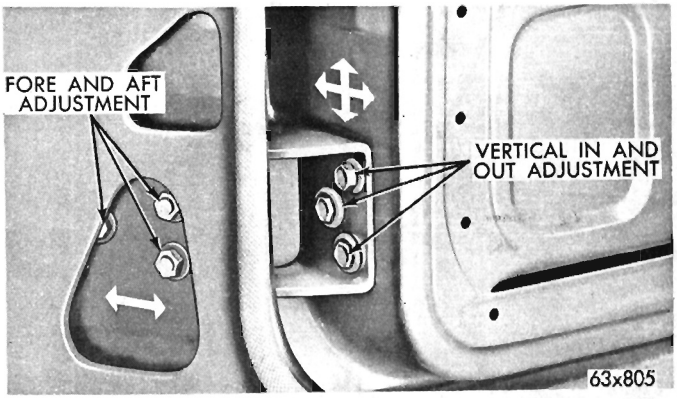


Fig. 8—Front Door Hinge Adjustment (Plymouth Shown)

Moving Door Ahead or Back (Front Door)

Moving the door ahead or back is accomplished by loosening either the upper or lower hinge bolts.

To move the upper portion of the door ahead or back (kick panel removed), loosen the upper hinge strap bolts and either pull or push the upper portion of the door in the desired direction. Tighten the hinge strap bolts and test the fit. When correct reinstall the cowl trim panel.

To move the lower portion of the door ahead or back (kick panel removed), loosen the upper hinge strap bolts and either pull or push the lower portion of the door in the desired direction. Tighten the hinge strap bolts and test the fit. When correct, reinstall the kick panel.

Fitting the Front Door Flush with the Adjacent Panels

If the door is not flush with the adjacent panels correct by loosening the hinge strap bolts (on front doors or hinge strap bolts on the rear doors).

It should be remembered that when loosening the upper hinge and pulling "**out**" or pushing "**in**" on the front upper corner of the door, the lower corner of the door will be moved inward or outward also. The opposite corners of the door will also be affected in a similar manner when the lower hinge is moved "**in**" or "**out**". This applies to both the front and rear doors.

Rear Door Adjustments (Fig. 9)

To move the door up or down in the body opening or move the door in or out to bring the door panel flush with the body proceed as follows:

(1) Loosen the hinge attaching bolts at "B" pillar.

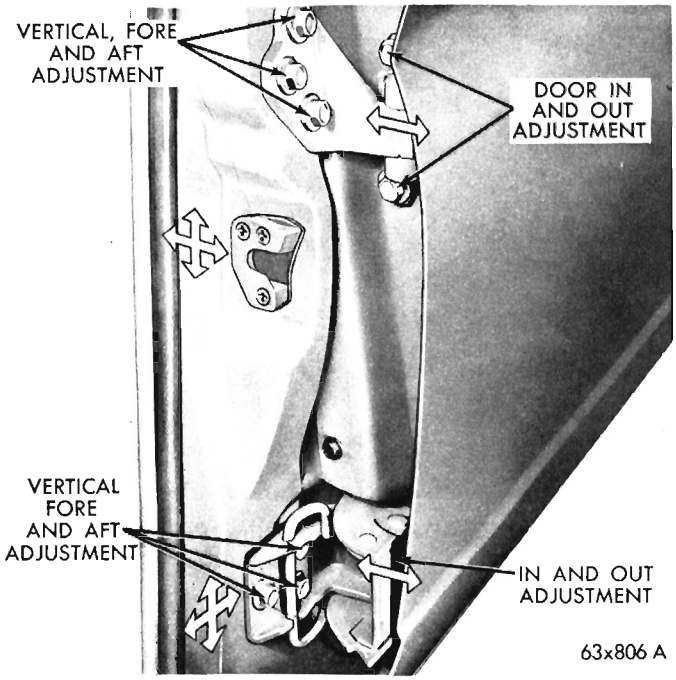


Fig. 9—Rear Door Hinge Adjustment (Plymouth Shown)

(2) Move the door as required to obtain the proper fit with the door opening.

(3) Tighten the bolts securely.

Final Striker Plate Adjustment

After the door has been centered in its opening and all hinge bolts have been tightened 18 to 20 foot-pounds torque. Test the door for easy opening and closing.

Be sure the top surface of the striker plate is parallel with the bottom of the door latch. The striker plate is properly positioned when the door has a very slight lift as it is closed. This also prevents door noise when the vehicle is in motion.

If the proper adjustment cannot be obtained, the use of shims between the latch plate and pillar should be used. The shims are available in $\frac{1}{32}$ and $\frac{1}{16}$ inch thickness (The shims are used to bring the latch plate closer to the door for the full engagement.)

The door weatherstrip seal can be tested by holding a heavy piece of paper (similar to a shipping tag) on the weather seal and then closing the door. A slight drag should be felt as the paper is being pulled out.

If no drag is felt, move the striker plate in closer. This paper test should be made all around the door at about six inch intervals.

If no drag is felt on the paper, make the necessary adjustments to either or both hinge or the striker plate.

10. DECK LID ALIGNMENT

The rear deck lid is attached to the body with two hinges and is held closed by the lid latch and lock.

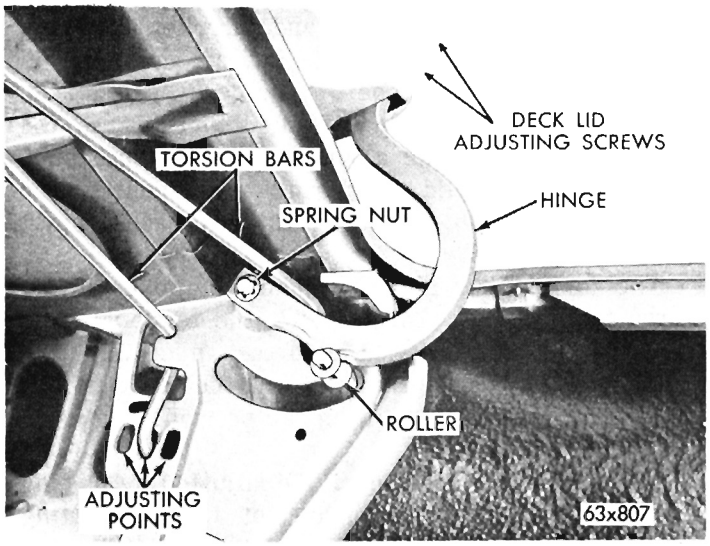


Fig. 10—Deck Lid Hinge and Torsion Bar

The weight of the lid is counterbalanced in all positions by spring tension of two torsion bars (see Fig. 10). (On Convertible Models, the weight of the lid is counterbalanced by four springs, two each side.) (See Fig. 11.) The torsion bars are long, small diameter steel bars, that are free at one end and anchored to a

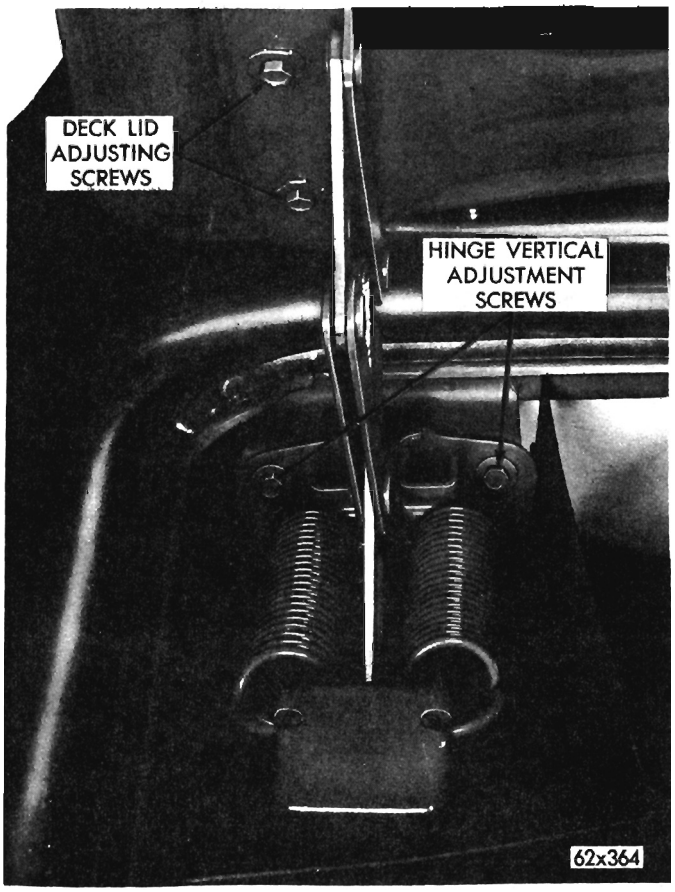


Fig. 11—Deck Lid Hinge (Convertible)

support bracket at the other end. A roller sleeve on the free end, operates against a "cam contour" on the back face of the hinge. As the deck lid is raised, action of the rollers against the hinges cause the bars to twist, exerting a torsional spring resistance that balances the lid. To permit adjustment of the torsion bar tension, slots are located in each support plate.

The torsion bar hinge mechanism applies lifting force to the hinge arms. Moving the torsion bar to the rear holes increases the force applied and provides greater assistance in lifting the deck lid. (A tool to perform this operation can be made and used, as shown in Figure 12.)

The torsion bar tension can be adjusted by placing the end of the bar in one of the slots in the mounting bracket. The upward travel of the deck lid is limited by a stop on the bracket, which contacts the hinge arm.

The torsion bar ends are lubricated at the factory and should not require lubrication; however, if the torsion bar is replaced or should squeak, the inside roller at the torsion bar end should be coated with lubricant. Refer to "Front Suspension," Group 2.

CAUTION: Use extreme care when removing the torsion bars. Due to the tension required to make the bars effective, the bars will unwind.

Center Deck Lid in Opening

The two bolts holes in each of the deck lid hinges are oversize, thereby permitting the lid to be moved ahead or back. When positioning, locate the lid so extreme rear portion along the sides are both flush with the body panel as well as equally spaced in the opening. To adjust, loosen the hinge bolts (one at a time) as shown in Figure 13. Move the lid in the desired direction, retighten the bolts. Repeat this operation on the opposite side until the lid fits flush with the body and quarter panels.

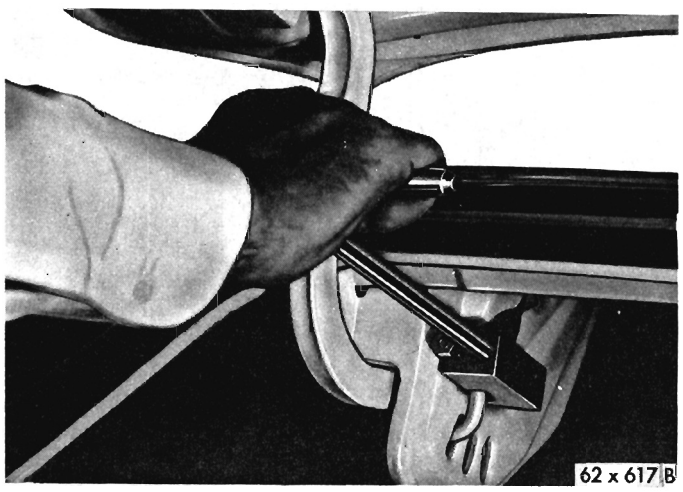


Fig. 12—Torsion Bar Removal or Installation

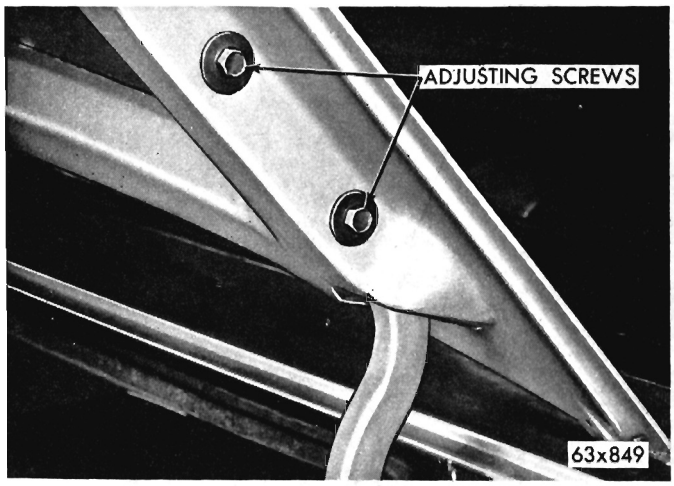


Fig. 13—Deck Lid Adjusting Points

Testing Latch and Striker Plate

Both the latch and striker plate are adjustable, but better results can be obtained by adjusting the striker plate. The striker plate is adjustable in two directions, forward and backward, and to either side. As the plate moves to the rear, it also rises making it easier to close the lid. Moving the plate forward lowers it and makes the lid harder to close.

Deck Lid Lock Adjustment (Fig. 14)

Vertical adjustment of the deck lid lock is made at

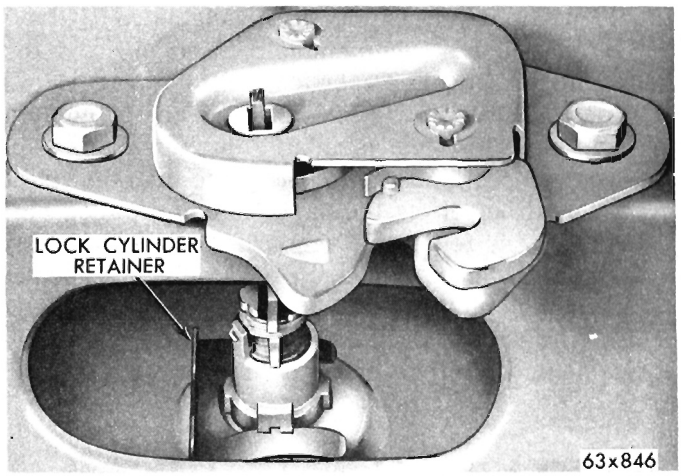


Fig. 14—Deck Lid Lock

the lock attaching screws (Fig. 14). The side adjustment is made at the deck lid striker attaching bolts.

11. TESTING FOR A CORRECTLY FITTED DECK LID

A correctly fitted deck lid is one that is centered in the opening, and fits flush with the body panels. A test for the proper fitting and seal of the deck lid can be made with strips of paper. Insert the strips of paper (about one inch wide) along the edge of the deck lid opening, close the lid. If the papers fit snug all along the edges of the lid as they are pulled out, a good seal is evident. If the paper fits loosely on one side, and tight on the other, the deck lid should be aligned.

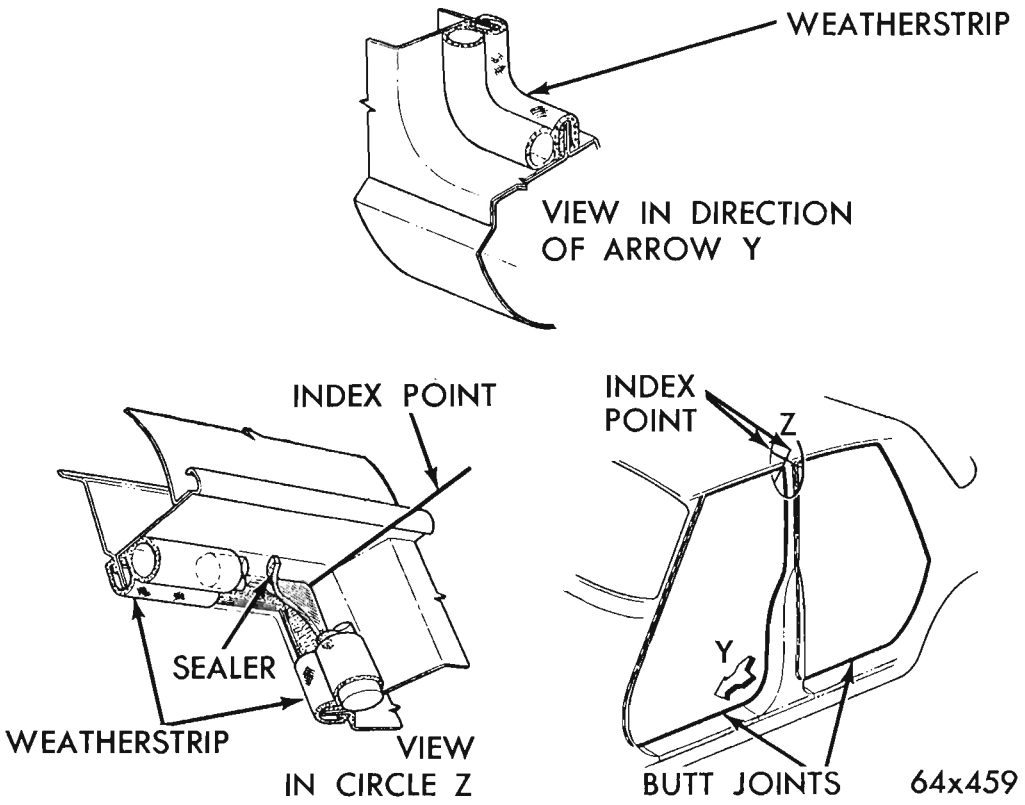


Fig. 15—Front and Rear Door Weatherstrip (Sedan)

PART 3
BODY SEALING

12. BODY SEALING PROCEDURES

Super Rubber Cement—This cement may be used where a strong bonding of rubber parts to painted or unpainted steel surfaces is desired. It can be used for such purposes as the attachment of weatherstripping on doors and luggage compartment lid, or for the attachment of felt pads.

Windshield Rubber Sealer—A light viscosity, colorless rubber expander, this sealer can be used where rubber is confined between a glass and metal channel, such as on the windshield and rear window glass assembled in one-piece type weatherstrips. When applied to the edge of the rubber, it will expand the rubber within 15 to 20 minutes. This sealer will not harm paint or chrome finish and can easily be removed with a cloth before it sets.

NOTE: Before sealing, always clean all surfaces to be cemented with unleaded gasoline. Do not use kerosene, as this liquid leaves a thin film of oil which will prevent adequate adhesion of the sealer.

Dash Panel (Outer)

Inspect the dash panel seams, screws, clips and punch holes. Inspect the sealing of rubber grommets.

Cowl Panel Joints (Inner)

Inspect the various openings in the cowl for possible leakage around the cowl vent and windshield opening. Clean the seamed area thoroughly and apply Heavy Sealing Putty or Body Seam Sealer. Be sure to apply the sealer over the hood hinge bracket and along the seam to the rear end of the front fender.

Door Hinges

Inspect the sealer on the door hinges at the pillar post. The sealer should be filled flush with the pillar post. This should be done after door fitting, as the sealer may become cracked or loose. Reseal as necessary.

NOTE: Water testing a vehicle should be done by sections. Working on small areas, it is possible to locate the points which require sealing. The correct method of water testing a vehicle should be from the bottom up, not from the top down.

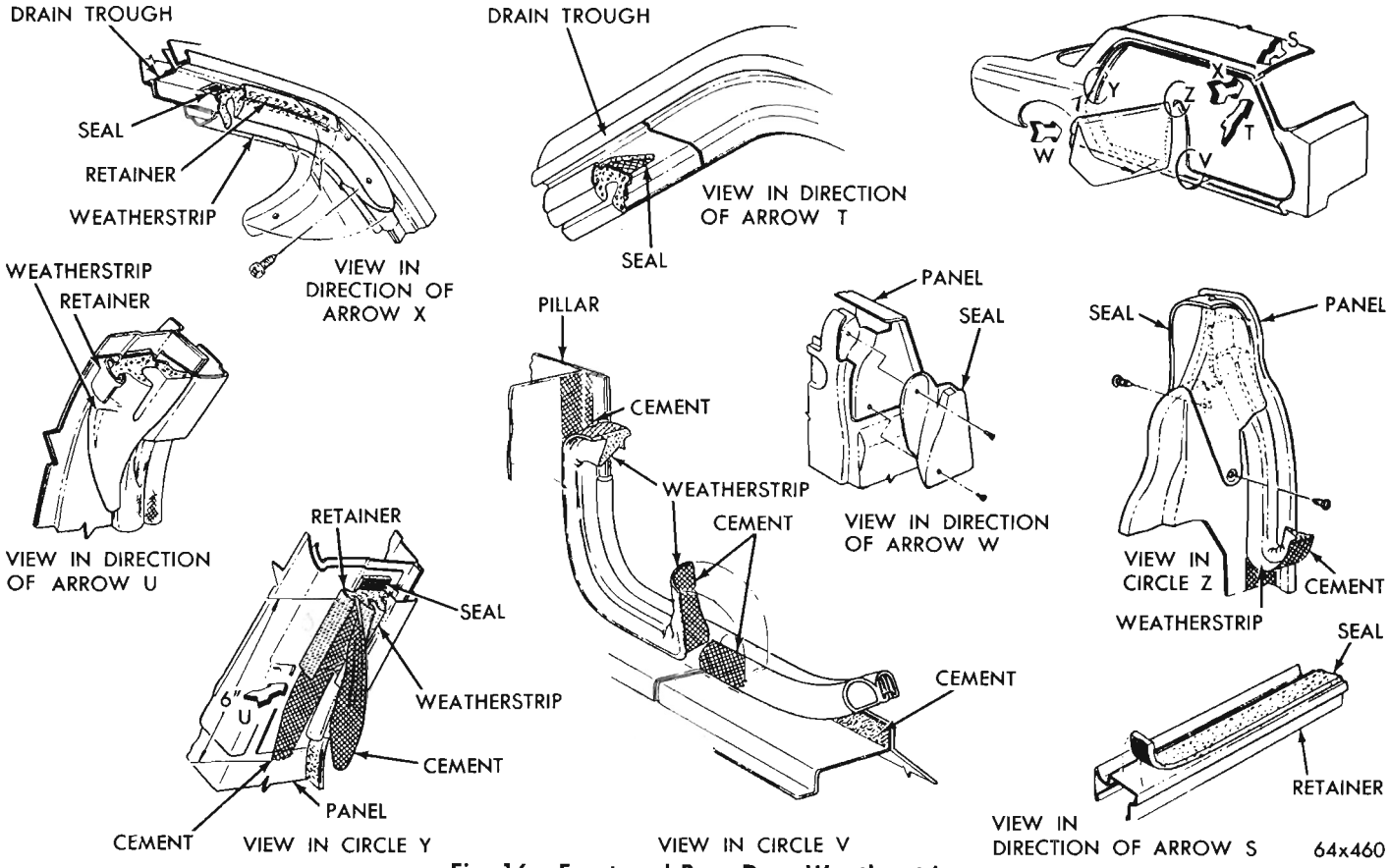


Fig. 16—Front and Rear Door Weatherstrip (Hard Top)

A strong force of water should never be played on the vehicle, since a perfectly sealed vehicle may leak under this condition.

It is advisable, when testing the leaks in a vehicle to start with the windshield wiper pivots, windshield, vent wings and then the remainder of the body.

13. DOOR OPENINGS AND DOOR (Figs. 15 and 16)

Door openings contribute to water leaks in two ways: First, there may be leaks at the metal joint seams and secondly, the door weatherstrip may not be effecting a good seal. Prior to sealing, test the door sealing using a water or powder test. A visual inspection may also aid in diagnosing the source of the leak.

The door weatherstrip should show no bunched, kinked or stretched areas. The seal should be butt-jointed with no opening. In event the door opening weatherstrip surfaces are uneven, the weatherstrip will not effect a good seal. Build up low areas, between the weatherstrip and the door opening panel with a closed cell rubber shim.

When it is necessary to install a new weatherstrip, first remove all the old weatherstrip, sealers and cement. When solvents are used to remove the sealers and cement, use only those types which will leave the metal clean, free of oils and perfectly dry. Install a one piece design weatherstrip on the door opening fence and index it at the sill to center pillar joint. Apply cement completely around the weatherstrip and press it firmly onto the fence. The butt-joint of the weatherstrip should be thoroughly cemented at the mating ends and correctly aligned. After the cement has set up, test the door for leaks.

14. FRONT DOOR VENT WINDOW

Leaks through the vent window can be located by a water test. After locating the leak area, inspect the condition of the vent weatherstrip, the fit of the vent glass in the vent opening, and the compression of the vent glass weatherstrip.

In most cases simple adjustments will correct leaks between the vent glass and the weatherstrip. To increase the pressure of the glass against the upper portion of the weatherstrip, install shims from the closed cell rubber shim stock between the upper vent pivot bracket and the outside of the vent glass.

Application of black mastic or body sealer to the corners of the vent weatherstrip generally corrects the leak in this area if the weatherstrip overlaps. If the weatherstrip is severely damaged, install a new vent window assembly.

Leaks around the pivots can be corrected by the use of black mastic. Fill the openings in the weatherstrip. Seal around the upper pivot bracket at the door frame and at the junction of the division bar and door frame.

The first and most important requirement to obtain a good water tight seal between the door window and the roof rail weatherstrip is precise adjustments of the doors, and window frames and channels. Adequate adjustments are provided for up and down, in and out, and fore and aft adjustment of the window frames. It is important that the weatherstrip has sufficient pressure against the frame, but too great pressure will push the window frame out of alignment and will prevent proper contact with the mating window weatherstrip.

15. WINDSHIELD WEATHERSTRIP

Seal the weatherstrip against the body opening by carefully working a thin coating of Windshield Rubber Sealer, or Body Seam Sealer, between the body edge and the rubber moulding, or, lift the lip of the rubber weatherstrip where it contacts the body metal, and use a nozzle-type applicator (sealer gun) to force the sealer deeply around the entire edge. It is rarely necessary to reseal between the glass and the weatherstrip, unless the glass has been replaced. If faulty sealing of the glass to the weatherstrip has caused a leak, remove the windshield garnish moulding and apply sealer as far down as possible between the inner weatherstrip and the glass for a considerable distance on each side of the leakage point. Clean off excess sealer with a rag. Reinstall the mouldings and test for proper seal.

16. REAR WINDOW

If the water enters the luggage compartment under the package shelf, remove the rear window lower trim moulding and clean out the old sealer from the trough below the weatherstrip. Apply semi-fluid sealer or rope type sealer along the entire length of the trough. Seal the trough at both lower corners of the window.

To aid in the installation of the moulding, mark the clip holes by placing balls of sealer to the rear of each moulding hole. This helps align the trim moulding retaining studs with the holes and avoids the possibility of moving the sealer or damaging the paint. Remove balls of sealer when moulding is installed.

17. DECK LID

Before water testing the deck lid make certain the deck lid is properly fitted. Start the water test at the

bottom and work slowly toward the top of each side. Then work across the top of the lid. Test the two upper and lower welded joints for proper sealing.

If the leakage occurs at the seam between the weatherstrip trough and the deck upper panel and quarter panel, fill any openings with a rope type sealer and paint the sealer body color if necessary.

18. TAIL LAMP OPENINGS

Water test the tail lamp area for possible leakage into the luggage compartment. Water will enter the trunk area between the tail lamp housing and quarter panel openings. To secure a good seal use a hand type caulking compound and seal the opening from inside the luggage compartment.

19. LUGGAGE COMPARTMENT

Leaks may occur at medalions or clip-holes, tail lamps or the rear quarter panel which will generally appear in the luggage compartment, floor extensions near the quarter panel.

Before attempting to correct luggage compartment leaks, carefully determine the source of the leak. As it was explained in the previous paragraphs, water on the upper portion of the wheel housing may be coming in because of a leak at the lower moulding of the rear window. A leak inside the luggage compartment between the outer wheel housing and quarter panel may originate at the corner of the rear quarter window.

NOTE: Do not confuse condensation on metal parts with water leaks.

When the actual source of the leaks has been traced to the luggage compartment itself, correct as follows:

Be sure to obtain the proper fit and alignment of the luggage compartment deck lid before trying to correct the leak at the deck lid weatherstrip. Inspect the luggage compartment deck lid drain trough and

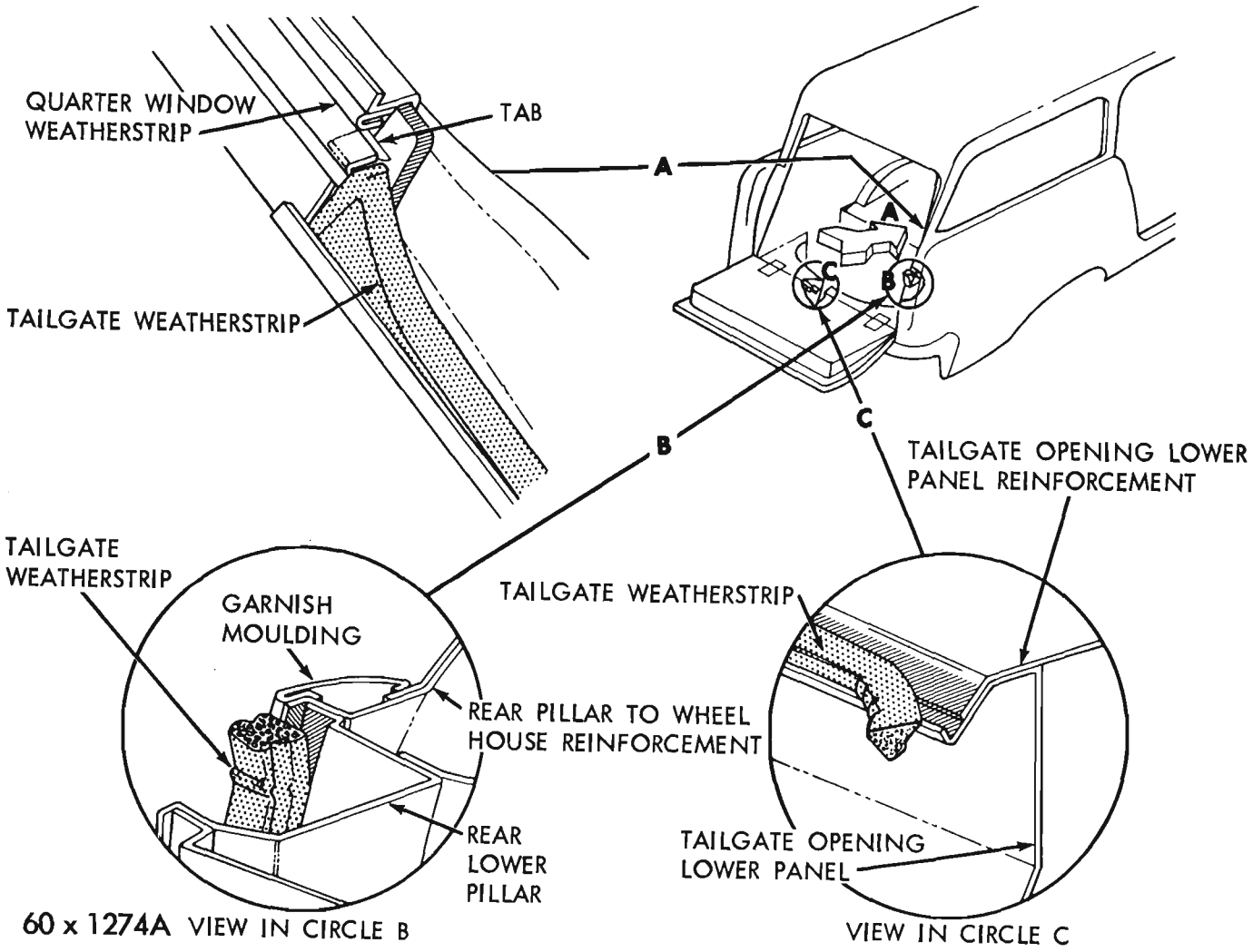


Fig. 17—Tail Gate Weatherstrip

weatherstrip retainer joints for rough and porous welds. Seal with body caulking putty or body sealer as required. Brush a continuous coating of weatherstrip cement around the entire weatherstrip trough. Install the deck lid weatherstrip into the retainer. Be sure weatherstrip retaining lips are engaged in the retainer trough. Be sure to obtain the proper compression of the deck lid weatherstrip. Adjust the deck lid if necessary to obtain the proper compression. Test with the use of slips of paper, trace powder and a testing bulb.

Leaks at the deck lid weatherstrip retainer trough joint bodies can best be sealed by loosening the weatherstrip at the joint and applying sealer to the entire seam at the inside of the trough and then recementing the weatherstrip.

Seal all openings and joint seams on the inside of the luggage compartment lower panel, especially the back-up lamp wire grommets. Seal all luggage compartment floor panel seams with liquid body sealer. Seal between the luggage compartment lower panel and foor panel with black mastic sealer.

20. STATION WAGON

Sealing procedures pertaining to the roof, cowl, firewall, fresh air vent, doors and openings are essentially the same as contained in the section devoted to the sedans and coupe models.

21. TAIL GATE GLASS RUN CHANNEL

Water leaking past the glass run around the channel may be sealed off by applying sealer to indicated points. Water leaking around the glass run may be sealed by removing the glass run and applying additional beads of sealer to the glass run channel. Press a bead of rope type seal into the moulding seams and clean off the surplus. While the rear pillar garnish moulding is removed, inspect the outer "**O**" shaped opening, if necessary seal. This opening should be filled with caulking putty.

22. TAIL GATE WEATHERSTRIP

(Figure 17)

The tail gate weatherstrip is designed to fit under a lip and into a channel at the sides of the tail gate opening. At its upper end a piece extends out and fits up into the bottom of the pillar. Remove all weatherstrip that is not installed properly. Clean the channel and the weatherstrip with cement removing solvent. Apply a coat of cement to each part and reinstall weatherstrip. At the bottom of opening it is sometimes necessary to remove the weatherstrip and after cleaning, shim the weatherstrip surfaces and reinstall.

PART 4

MINOR BODY SERVICING

23. FENDERS

Removal

(1) Remove the outer headlamp door and headlamp assembly.

(2) Remove the fender to radiator core support attaching bolts.

(3) Remove the bolts attaching the fender to the stone shield.

(4) Disconnect the headlight ground wire at the fender. (If the left fender is being removed, remove the battery cables from the battery and remove the battery.)

(5) Remove the outside rear view mirror or the antenna lead (if so equipped).

(6) Remove the fender rear splash shield.

(7) Remove the bumper assembly.

(8) Remove the bolts attaching the fender to the splash shield, and remove the fender by pulling forward and outward.

Installation

(1) Place masking tape over the forward edge of the front door to protect it from scratches during installation of the fender.

(2) Position the fender on the splash shield and install two or three bolts finger tight only to hold the fender in position.

(3) Install the balance of the fender to splash shield bolts loosely.

(4) Align the fender and tighten all bolts securely.

(5) Install the fender rear splash shield.

(6) Connect the headlamp ground wire.

(7) Install the headlamp assembly.

(8) Install the headlamp door.

(9) Install the fender core support attaching bolts and tighten securely.

(10) Install the bumper assembly.

(11) Install the battery assembly and connect the battery cables.

24. RADIATOR CORE SUPPORT

The radiator core support is the basic foundation for all front end sheet metal. In the case of an accident it is best to replace the support if there is indication of sheet metal misalignment.

Removal

(1) Drain the radiator, remove the radiator hoses and the radiator core attaching screws. Remove the radiator from the engine compartment.

(2) Remove the hood lock striker bar.

(3) Remove the horn and headlamp wiring from the core support.

(4) From under the fenders remove the fender side shield to core attaching screws.

(5) Remove the core support to frame attaching screws.

(6) Remove the radiator core support up and out of the engine compartment.

Installation

(1) Position the radiator core support down into the engine compartment. Install the frame to core support attaching screws finger tight.

(2) From under the fender install the fender side shield to core support attaching screws only finger tight.

(3) Attach the horn and headlamp wires to the core support with the plastic straps.

(4) When all the attaching screws have been installed tighten them securely.

(5) Install the radiator core, and radiator.

25. BUMPERS AND GRILLE

Refer to Figures 18, 19, 20, 21, 22 and 23 for the bumper and grille attaching points.

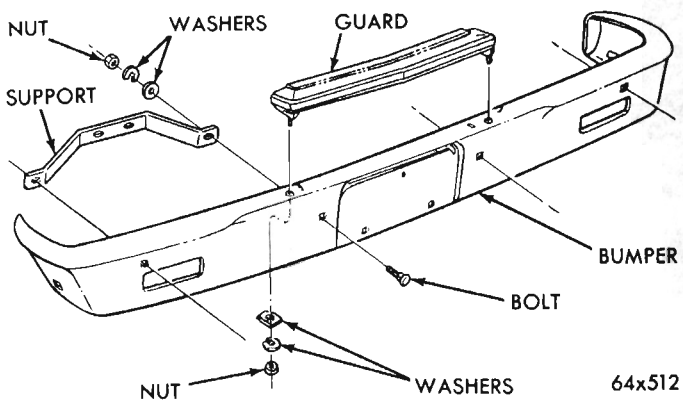


Fig. 18—Front Bumper Attaching Points (Plymouth)

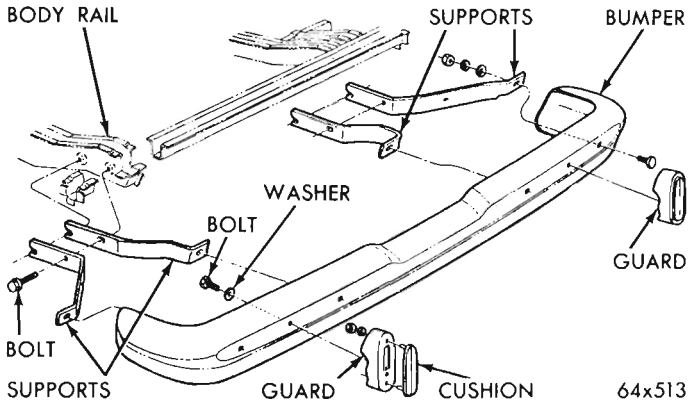


Fig. 19—Rear Bumper Attaching Points (Plymouth)

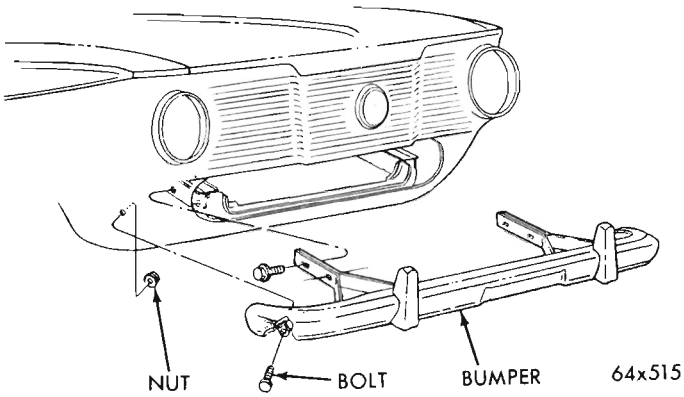


Fig. 21—Front Bumper Attaching Points (Valiant)

26. FRONT DOOR TRIM AND HARDWARE

Inside Handles

Both the inside door and window regulator handles are retained to the shaft by a screw in the hub of the handle (Fig. 24.)

Door Trim Panels

(1) Remove the inside handles and arm rests.

(2) Insert a wide blade screw driver between the trim panel and the door frame next to the retaining clips and snap out the retaining clips around the edge of the trim panel. Remove the trim panel from the door.

(3) Before installing the door trim panel, observe the condition of the weather curtain cemented to the door frame.

(4) Be certain escutcheon springs are placed on the regulator and remote control shafts.

(5) Align the trim panel retaining clips with the holes of the door frame and bump into place with the heel of the hand.

(6) Install the escutcheon washer, handles, and arm rest.

Door Weatherstrip Assembly

(1) Remove the attaching screws and step plate from the door sill.

(2) Starting at one end of the trim and weather

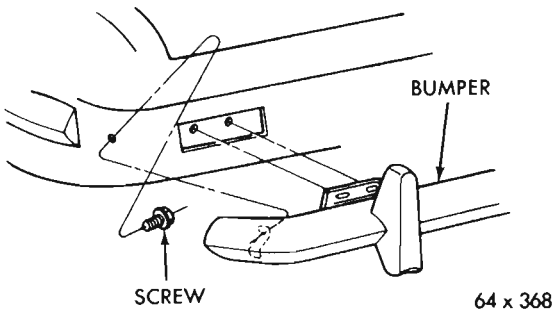


Fig. 22—Rear Bumper Attaching Points (Valiant)

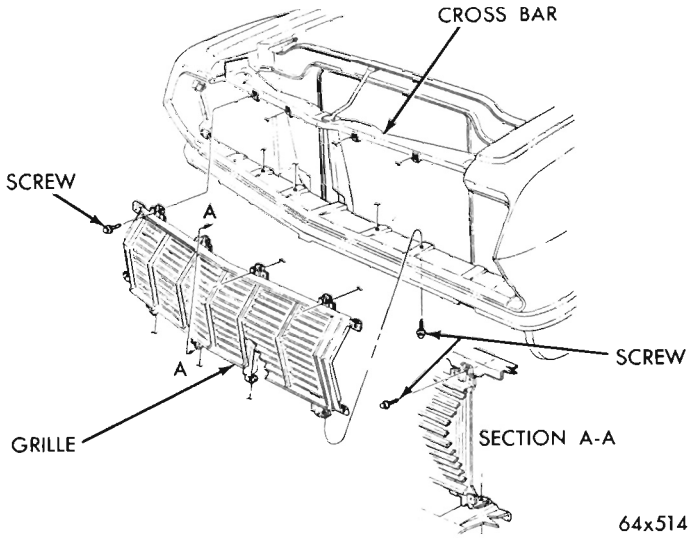


Fig. 20—Grille Attaching Points (Plymouth)

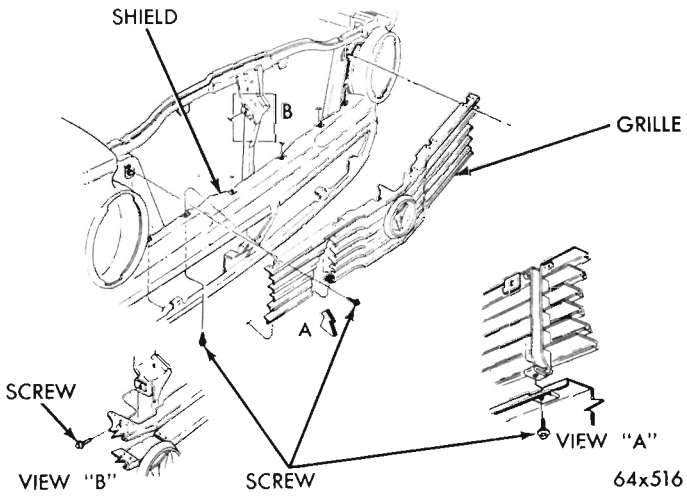


Fig. 23—Grille Attaching Points (Valiant)

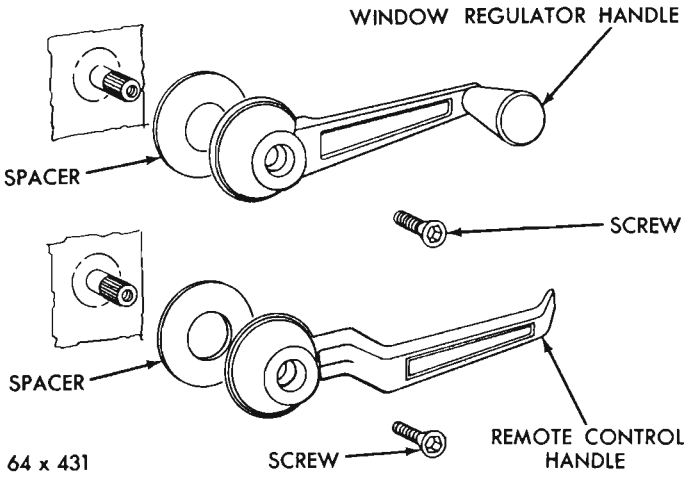


Fig. 24—Inside Handle Attachment

seal, pull the assembly off the door opening flange (Fig. 25).

(3) On installing the trim and seal assembly locate the ends at the center of the step plate.

(4) Place the weather seal over the door opening flange and bump the retaining clips into place with the heel of the hand.

(5) Install the door step plate and the attaching screws.

27. HEADLINING REPLACEMENT

Sedan Models—Removal

Remove the dome light assembly and rear seat cushion assembly as well as the sun visors, side and upper windshield garnish moulding.

(1) Pull the rear of the headlining out at the top and down the sides of the rear window opening.

(2) Pull the headlining from under the rear package shelf and away from the rear panel and wheel housing.

(3) With a screw driver, pry the headlining retainer strip away from the roof rail above the doors. The headlining is cemented in place over the windshield header and at the rear window body opening. To remove the lining it will be necessary to remove the cemented front and rear sections before removing the headlining and the bows from the roof rails.

The roof rails on all models using cloth headlining are strung through retaining loops sewed into the lining. Each bow is held in place by an attaching loop pressed into each roof rail (Fig. 26) and spring in place when installed to keep the headliner taut.

(4) After pulling headlining from over doors and package shelf, start at the windshield pull lining from the header. Use care not to damage the lining.

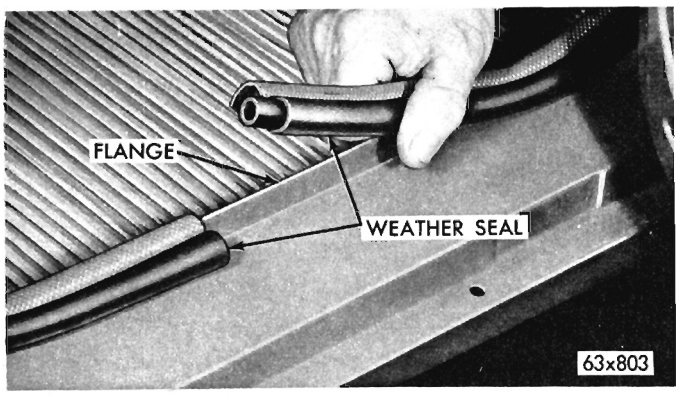


Fig. 25—Door Weatherstrip

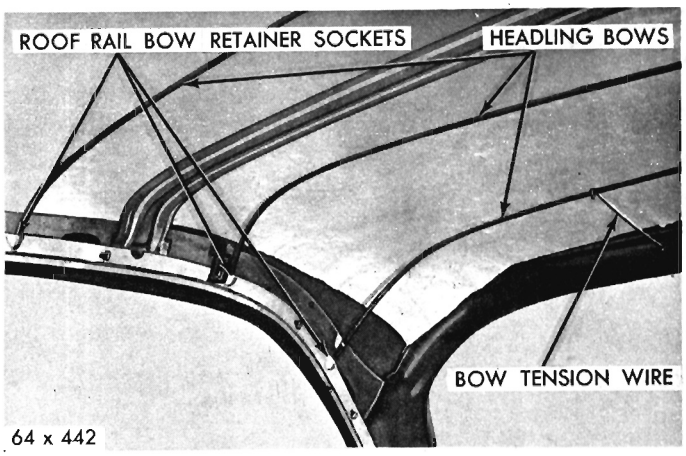


Fig. 26—Headlining Bows

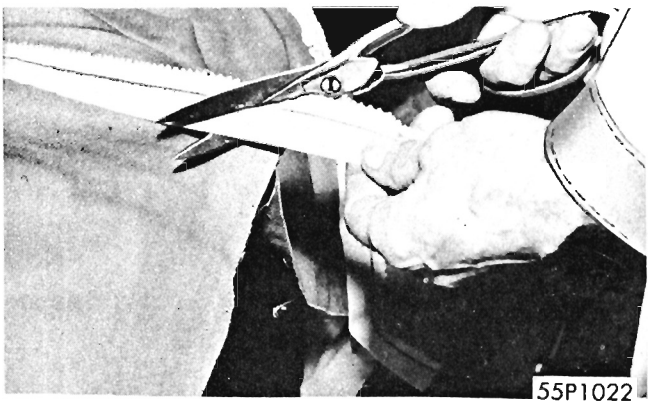


Fig. 27—Trimming Excess Listing

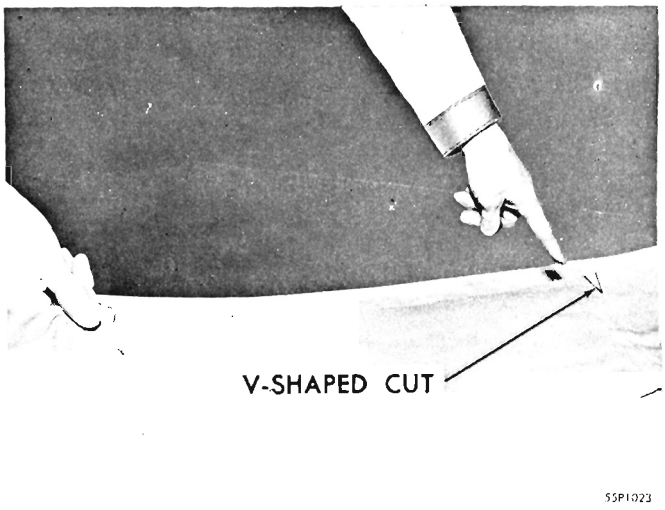


Fig. 28—Marking Center of Headlining Ends

(5) Remove the headlining bows from the roof rail retainers.

(6) Remove the bow retaining springs and remove the headlining from the roof, rear quarter and lower section under the package shelf.

Installation

(7) Starting at the rear of the headlining, remove each bow from the old listing and install it in position in the new headlining.

This procedure assures correct installation of the bows. Before installing the bows in the new headlining, trim the excess listing even with the edges of the headlining, as shown in Figure 27.

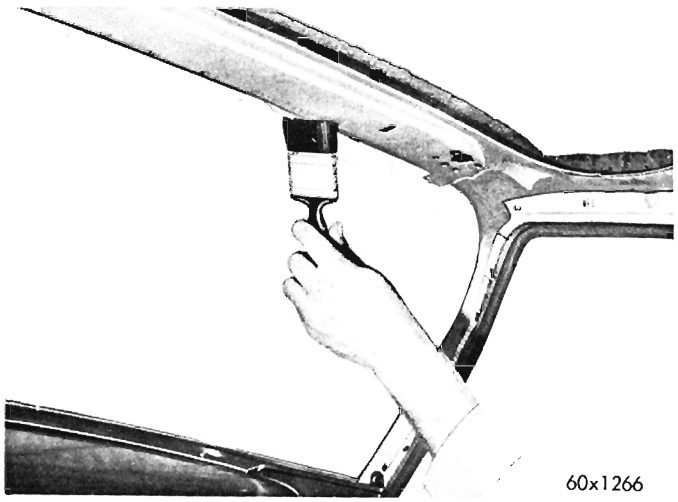


Fig. 29—Applying Cement to Windshield Header Bar

(8) Notch the headlining at the front and rear ends to indicate the center of the material by making small V-shaped cuts, as shown in Figure 28. Use these marks as guides to properly center the headlining.

(9) Begin at the rear of the vehicle. Install the rear bow tension springs (Fig. 26).

(10) Install the bows in the correct location. Bows are of different length and must be correctly positioned to prevent headlining from wrinkling.

Install the remaining bows, making sure to stretch the headlining evenly so that approximately the same amount of material hangs down both sides.

Apply cement to the windshield header bar (Fig. 29). Wait until it becomes tacky. Then stretch the headlining forward and over the cemented area, and onto the barbs on the windshield header. Make sure the first seam of the headlining is straight.

Cut holes in the headlining for the visor retaining screws and pivot. Install the visors before tucking in the corners of the headlining at the top of the windshield posts to prevent tearing the headlining when tightening the screws. Install the garnish mouldings.

In most cases the listing is longer than necessary. Cut the material at the ends to prevent wrinkling at the seams when it is tucked or cemented in place. Cut the listing from the end up to the clip. Use care to prevent cutting the listing too far up the bow and ruining the fit of the headlining.

After the listings are cut, start at the front and trim the headlining so that only ½ to 1 inch of material hangs down below the rear window opening.

Use a dull putty knife to tuck the first and second seam between the roof side rail and retainer, as shown in Figure 30. Tuck the remaining material in place around the rear window opening and the lower package shelf.

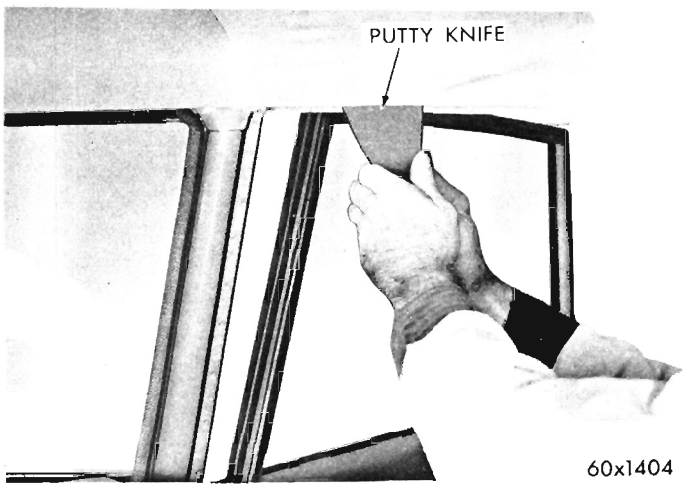


Fig. 30—Installing Headlining at Roof Rails

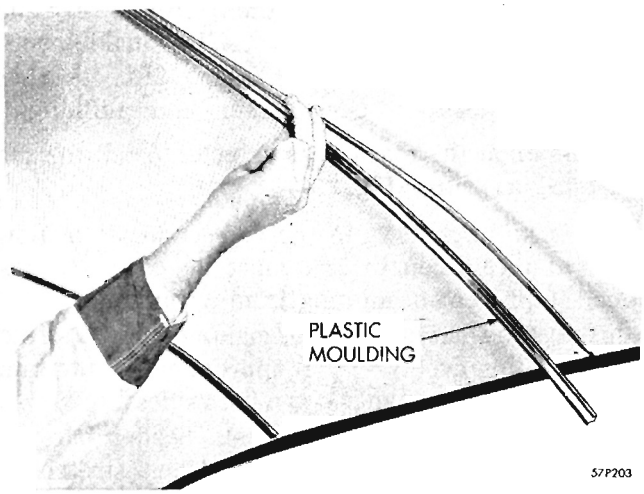


Fig. 31—Headlining Plastic Mouldings

When one man is performing the installation, alternate from one side to the other, completing one section at a time; make certain the seams are straight. As the work progresses, the material should be kept free of wrinkles until all the headlining is tucked in place between the roof and the retainer.

Install the rear window glass, dome light, side and upper windshield mouldings and the sun visor.

(12) Install the rear seat cushion.

Hard Top Models

If either of the outer sections are to be replaced it is only necessary to remove one plastic moulding. (See Fig. 31.) If the center section is to be replaced it will be necessary to remove both plastic mouldings from the retainers, as shown in Figure 31.

Remove the front and rear window garnish mouldings. Starting at either end, pry the plastic moulding off of retainer, using a screw driver. Pull down on the moulding to release it from the retainer. Remove the damaged section by pulling downward on the damaged section to release it from the retainer (Fig. 32.)

To remove the headlining at the side, pull toward the center of the vehicle and this will release the headlining from the small spring type clips at the outer edges.

To install the side pieces of the headlining push the headlining onto the small retainers at the sides of the vehicle. Push the headlining up at the center and properly center the moulding and snap it into place.

If the center section is to be installed push it into place on the retainers and snap the mouldings onto the retainers and install the garnish mouldings.

The headlining removal is the same except the headlining runs from side-to-side and it is only necessary to remove the garnish mouldings when the front or rear section of the headlining is being replaced.



Fig. 32—Removing Headlining Section

28. CUSTOM POSITIONED SIX-WAY MANUAL FRONT SEAT ADJUSTMENT (Fig. 33)

The custom positioned six-way manual front seat is

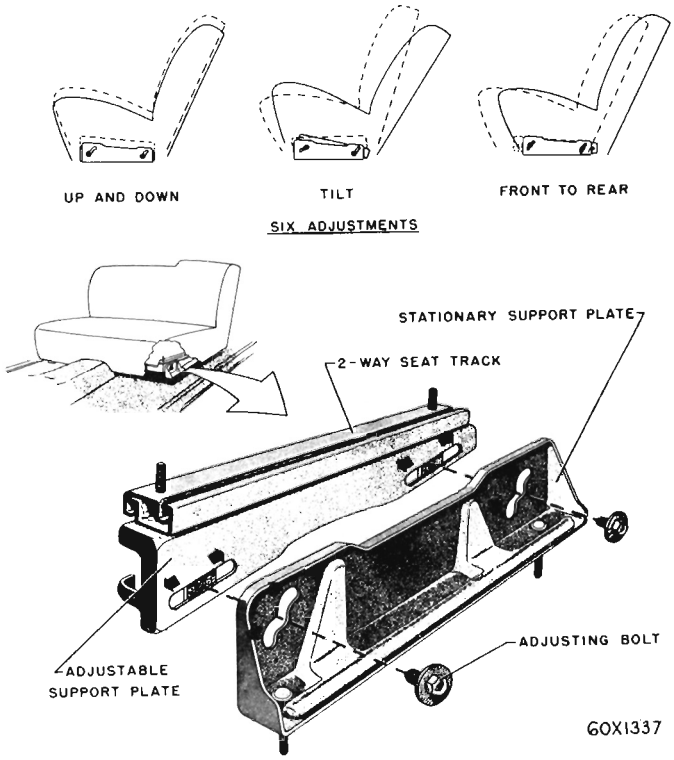


Fig. 33—Six Way Slotted Track Seal

standard equipment on all Plymouth models and on Valiant models equipped with bucket seats. All other Valiant models, front seats are adjustable only fore and aft.

(1) Loosen the four adjusting bolts (two in each seat base).

(2) The horizontal slots allow a fore or aft movement of 1⅝ inches.

(3) The vertical slots allow up, down or tilt movement of 1⅛ inches.

(4) Position the seat as desired and tighten the bolts to lock it in place.

29. FRONT SEAT

Removal

(1) The front seat cushion is an integral part of the seat frame. From under the vehicle remove the four nuts attaching the seat base to the floor pan.

(2) Remove the seat and base assembly.

Installation

(1) Place the seat and base assembly on the floor pan so that the studs in the seat base line up with the holes in the floor pan.

(2) Install the four attaching nuts and tighten securely.

30. REAR SEAT

The rear seat cushion is held in place by inserting the rear edge of the seat cushion under the lower edge of the seat back. The front lower frame of the seat engages into a slotted bracket welded to the floor pan.

Removal

(1) At the base of the seat frame midway from the floor pan tunnel and the end of the seat, press firmly toward the rear of the vehicle and disengage the seat frame from the hold down brackets.

(2) Raise the front of the seat up and withdraw it from under the seat back.

31. REAR SEAT BACK

The rear seat back is held in place by two tangs of the upper edge of the seat frame being inserted into slots in the package shelf. The lower edge of the seat back is held in place by two metal strips of the floor pan being bent over the lower edge of the seat back frame.

Removal

(1) With the seat cushion removed, bend up the two metal retaining strips at the lower edge of the seat back frame.

(2) Raise the seat back straight up and disengage the tangs from the package shelf and remove the seat back from the vehicle.

32. EXTERIOR MOULDINGS

Exterior mouldings are held in place by numerous clips "T" bolts, brackets and plastic retainers. The plastic retainer is a button type retainer with expanding legs that extend through holes in the sheet metal. These are expanded by forcing a tapered pin through the retainer and expanding the inner part of the retainer. The moulding is then snapped over the outer flange of the retainer. The mouldings may be pried off the retainer for replacement.

Reference to (Figs. 34, 35, 36 and 37) will demon-

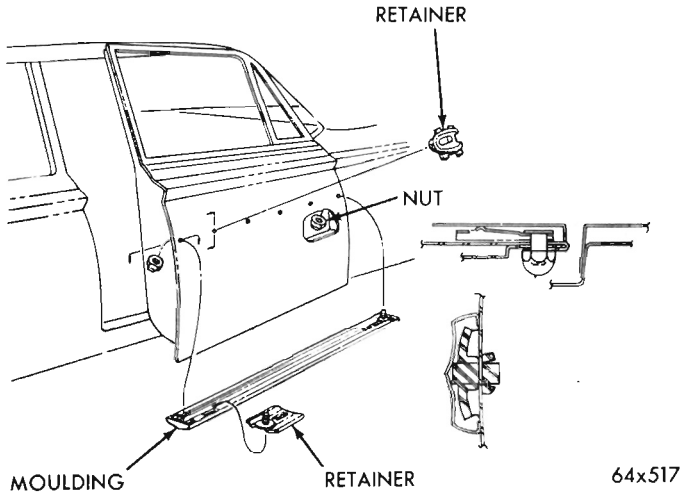


Fig. 34—Front Door Moulding Attaching Points (Plymouth)

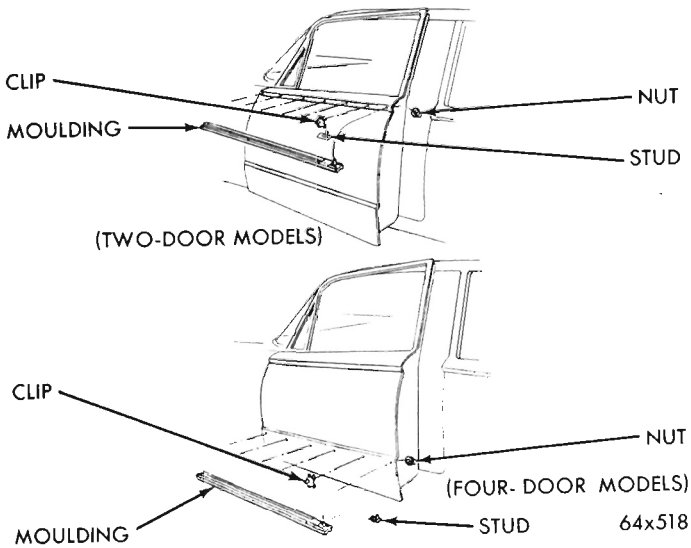


Fig. 35—Front Door Moulding Attaching Points (Valiant)

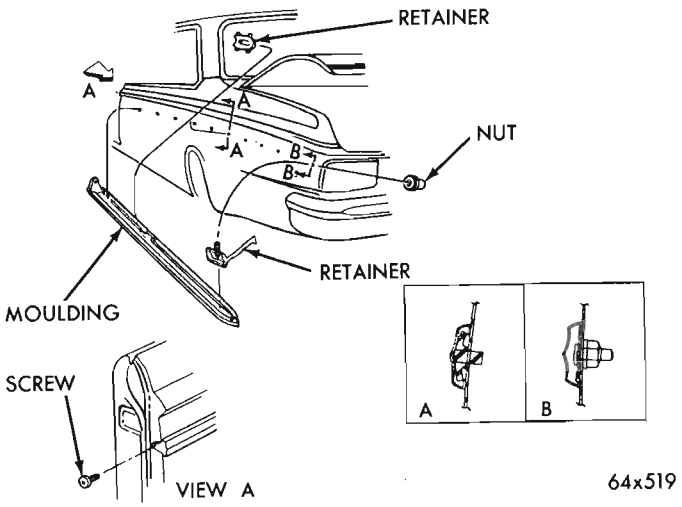


Fig. 36—Quarter Panel Moulding Attachment (Plymouth)

strate the type and location of retainers and clips used to hold the various mouldings in place.

33. DOORS, DECK LID, AND HARDWARE

Front Door
Removal

(1) With the door in the open position, place a jack, with a block of wood or pad on the lifting plate of the jack, as near the hinge as possible. (This will hold the weight of the door as the hinge bolts are loosened).

(2) Remove the inside handles, trim panel and weather shield.

(3) Scribe a line around the upper and lower hinge plates on the "A" post and also on the door panel.

(4) Remove the hinge attaching screws from the "A" post and remove the door for further disassembly.

NOTE: On vehicles with electric windows, disconnect the wires from the window regulator motor and remove from the door assembly.

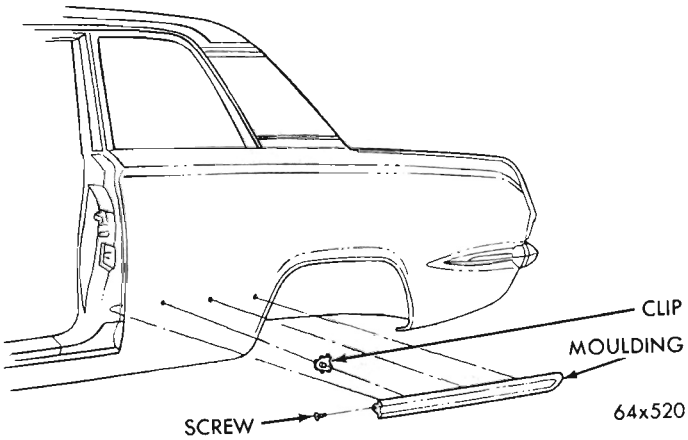


Fig. 37—Quarter Panel Moulding Attaching Points (Valiant)

Installation

(1) With the door inner hardware installed and the hinges attached to the door panel, place the door in position in the door opening, supported by a padded jack.

(2) Locate the door hinge plates on the body "A" post and install the hinge attaching screws only finger tight.

(3) Adjust the jack to align the hinge plate scribe marks on the "A" post and tighten the attaching screws.

(4) Complete the door aligning procedure and install the weather shield, trim panel and inside handles.

NOTE: Prior to this installation, on electric window lifts, install the wiring in the doors and attach to the motor and control switch.

34. REAR DOOR

Removal (4 Door Sedan)

(1) Open the rear door and place a padded jack under the door near the hinges.

(2) Remove the inside handles and door lock remote lever, upholstering trim panel and the weather shield.

(3) Scribe aligning marks around the hinge plates on the "B" post and on the door frame.

(4) Remove the hinge attaching screws from the "B" post and remove the door from the body.

NOTE: On vehicles with electric window lifts disconnect the wires from the motor and control switch and remove them from the door prior to door removal.

Installation

(1) With the rear door inner hardware installed and the hinges attached to the door panel, place the door in position in the door opening.

(2) Place the hinge plates in location on the "B" post and install the attaching bolts finger tight.

(3) Support the door on a padded jack and align the hinges with the scribe marks.

(4) Tighten the attaching screws and test the door for alignment.

(5) Install the weather shield, trim panel and inside handles.

NOTE: On vehicles with electric window lifts, disconnect the battery negative terminal at the battery,

insert the wiring into the door and attach the wiring to the motor and control switch prior to the installation of the trim panel.

(6) Open and close the door several times and test the alignment.

Removal (4 Door Hard Top Rear)

(1) Open the door and support it on a padded jack placed near the hinges.

(2) Remove the "B" post trim panel and scribe aligning marks around the hinges.

(3) Remove the door inside handles, remote lock lever, upholstering trim panel and weather shield.

(4) Scribe aligning marks around the hinges on the door panel and move the hinge attaching screws from the "B" post .

(5) Remove the door from the vehicle.

NOTE: On vehicles with electric window lifts disconnect the battery negative terminal at the battery, remove the wires from the motor and withdraw from the door panel prior to the door removal.

Installation

(1) With the rear door inside hardware installed in the door and the hinges attached, place the door assembly in the body opening.

(2) Support the door on a padded jack and align the hinges with the scribe marks in the "B" post.

(3) Install and tighten the hinge attaching screws.

(4) On vehicles with electric window lifts insert the wires into the door and attach to the motor and control switch.

(5) Install the weather shield, trim panel, inside handles and the remote lock lever.

(6) Open and close the door several times and test the alignment.

35. DOOR HINGES (All Models)

The door hinge replacement should be followed as suggested in paragraphs 34 and 35.

36. DOOR OUTSIDE HANDLE

(1) Remove the arm rest, inside handles, escutcheons, trim panel and the water shield.

(2) With the door glass in the "up" position, through the inner door panel openings (Fig. 38) remove the attaching nut and washer and the attaching screw and washer from the door handle.

(3) Unsnap the ball and socket of the linkage from the handle and remove the handle from the door.

(4) To install the handle, place the handle in the door and install the nut and washer and attaching screw on the handle.

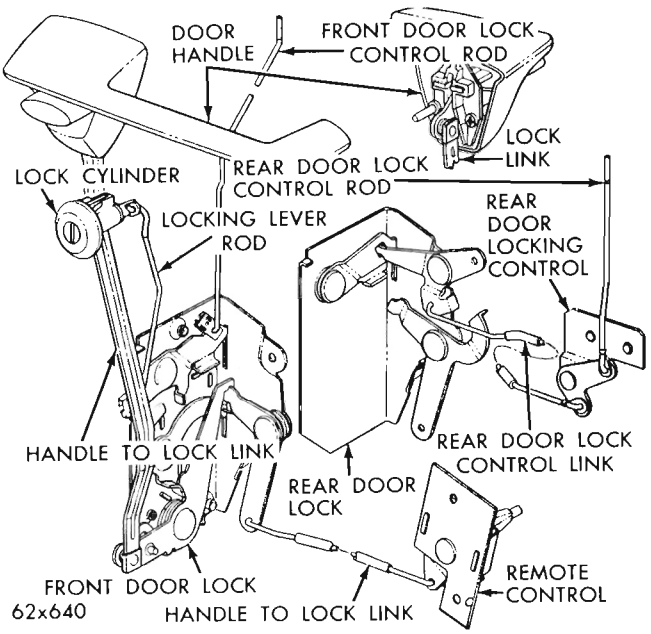


Fig. 38—Door Lock and Outside Handle

(5) Snap the socket of the linkage onto the ball of the handle assembly.

(6) Using Mopar All Purpose Cement install the water shield, trim panel, inside handles, arm rest and remote control lock knob.

37. LOCK CYLINDER (Fig. 39)

Removal

(1) Remove the inside handles, trim panel and weather shield.

(2) Using a screw driver through the access hole

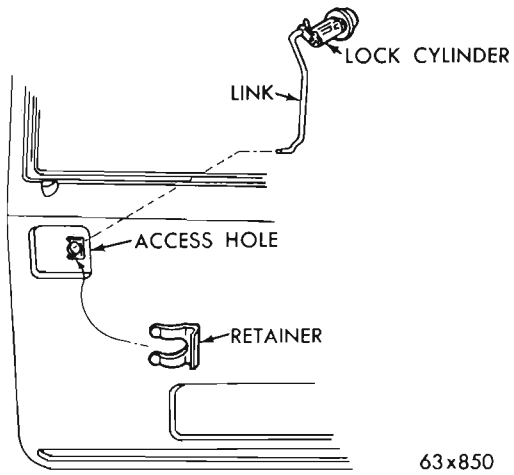


Fig. 39—Door Lock Cylinder Replacement

of the door panel pry the "U" shaped retainer off of the back of the lock cylinder.

(3) Withdraw the lock cylinder part way out of the door panel and with a rotating motion of the lock cylinder body, disengage the lock cylinder arm from the link.

Installation

(1) Hold the lock cylinder link in alignment with the lock cylinder hole in the door outer panel.

(2) Engage the hole of the lock cylinder arm with the link and rotate the lock cylinder until the link is locked in place.

(3) Enter the lock cylinder into place and install the "U" shaped retainer into the grooves of the lock cylinder.

(4) Using Mopar All Purpose Cement, install the water shield, trim panel and inside handles.

38. WINDOW REGULATOR (Front Door)

Removal

(1) Remove the inside door handles, arm rest, remote lock knob, trim panel and the water shield.

(2) Lower the door glass and remove the retaining clips and leather washers from the regulator arm studs (when so equipped).

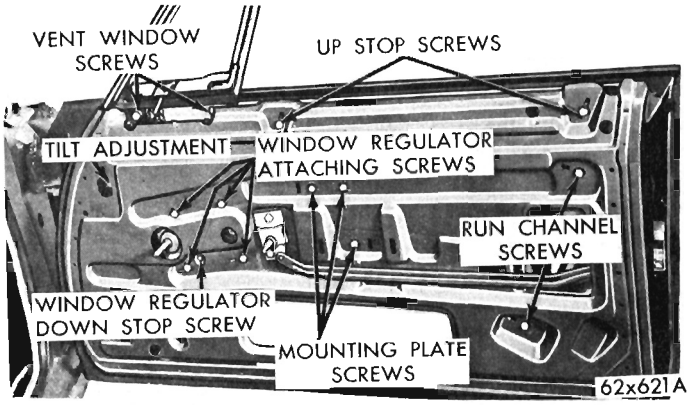


Fig. 40—Door Component Attaching Points

(3) Remove the regulator arm studs from the runs of the glass lower channel (where necessary).

(4) Prop the glass in the "up" position.

(5) Remove the window regulator attaching screws (Fig. 40).

(6) Remove the link and mounting plate attaching screws (Fig. 40).

(7) Slide the regulator arm link out of the pivot channel and remove the regulator from the door.

Installation

(1) Lubricate the channel of the regulator arm pivot and the slides of the glass lower channel with

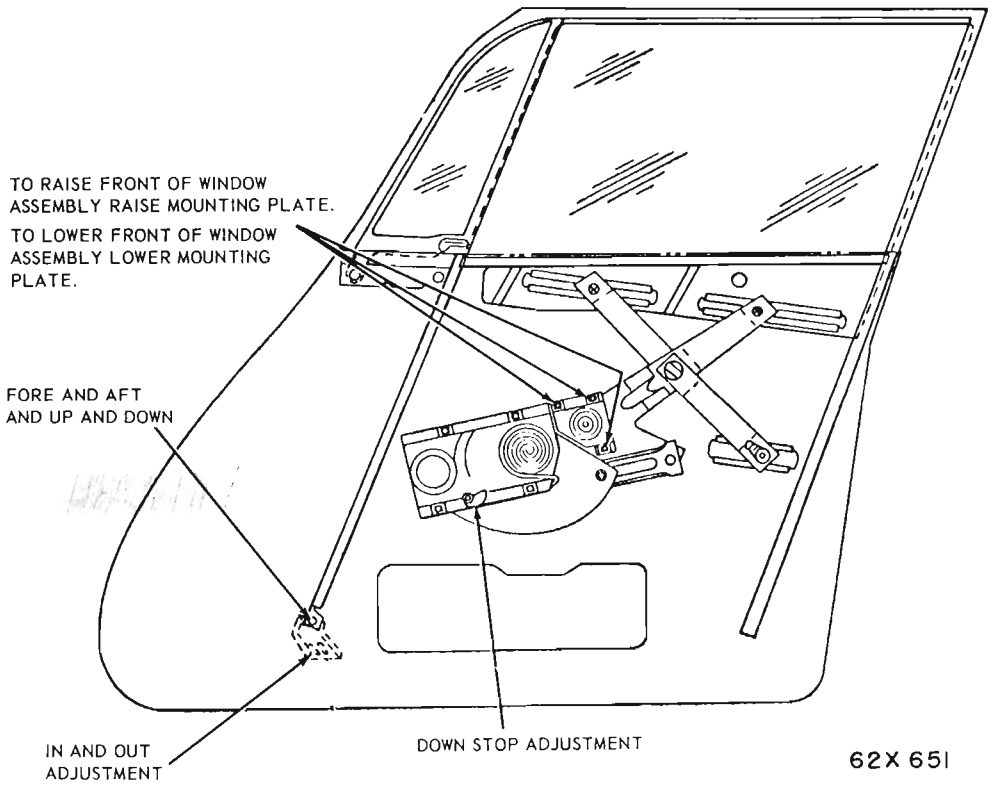


Fig. 41—Front Door—Sedan Adjusting Points (Plymouth)

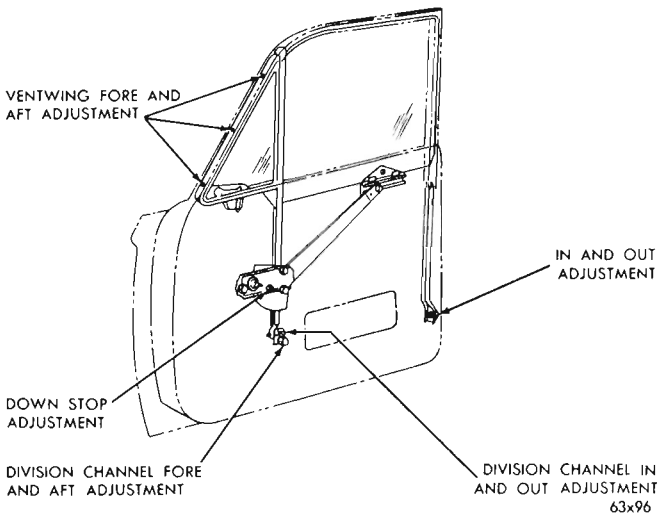


Fig. 42—Front Door—Sedan Adjusting Points (Valiant)

libriplate.

(2) Insert the regulator and link into the door and engage the pivot arm into the run of the pivot channel.

(3) Install the link and mounting plate screws finger tight.

(4) Install the regulator screws and progressively tighten to 60 inch-pounds torque.

(5) Lower the door glass and engage the regulator arm studs into the slides of the glass lower channel (where necessary).

(6) Install the leather washer and new retaining clips on the studs of the regulator arm studs (when so equipped).

(7) Adjust the level of the glass as outlined in Figures 41, 42, 43 and 44.

(8) Using Mopar All Purpose Cement install the water shield, trim panel, door handles, arm rest and the remote control lock knob.

39. REMOTE CONTROL AND DOOR LOCK (Front Door)

Removal

(1) Remove the inside handles, arm rest, remote lock knob, trim panel and the water shield.

(2) Remove the remote control attaching screws and disconnect the link.

(3) Remove the attaching screws of the door lock assembly (Fig. 38).

(4) Disconnect the link from the lock assembly.

(5) Rotate the lock assembly around the glass run channel and withdraw the lock from the door.

40. REAR DOOR REMOTE CONTROL ASSEMBLY

Removal

(1) Remove the arm rest assembly.

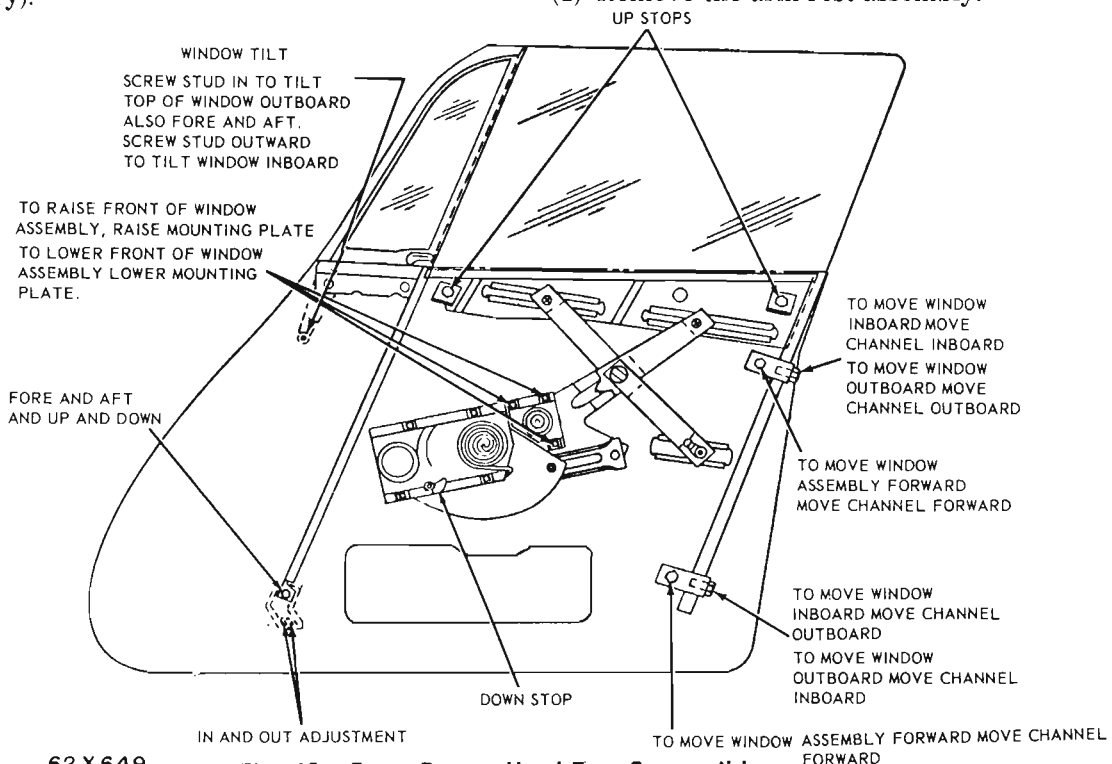


Fig. 43—Front Door—Hard Top-Convertible Adjusting Points (Plymouth)

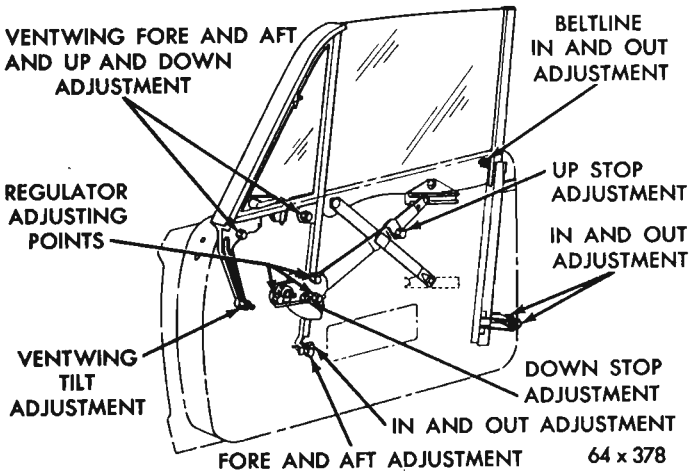


Fig. 44—Front Door—Hard Top-Convertible Adjusting Points (Valiant)

(2) Remove the inside door handle and the regulator handle.

(3) Remove the plastic knob from the door lock rod.

(4) Remove the door trim panel.

(5) Carefully remove the door water shield.

(6) Remove the screws attaching the remote control unit to the door inner panel and remove the remote control assembly.

Installation

(1) Position the remote control assembly on the door panel and install the attaching screws.

(2) Test the operation of the remote control assembly.

(3) Using Mopar All Purpose Cement install the water shield.

(4) Install the door trim panel, arm rest, door lock rod knob, regulator handle and the remote control handle.

41. DECK LID

Removal

Should it become necessary to remove the deck lid for replacement or repair, refer to Figure 5, and proceed as follows:

(1) Raise the deck lid and remove one of the two bolts in each hinge that attach the lid to the hinge arm. (Leave the remaining two bolts finger loose.)

(2) Brace the deck lid in such a manner so as to hold the lid in position while removing the last two bolts. (This will keep the lid from sliding down and damaging the rear deck.)

(3) Remove the last two bolts and lift the deck lid up and away from the rear of the vehicle.

Installation

When installing the deck lid, observe the same precautions as those taken during the removal procedures.

(1) Lift the lid and slide it down into position, install the attaching bolts.

(2) Do not tighten, just snug down.

(3) Lower the lid and test the fit.

(4) If necessary, adjust the lid, test adjustment of the latch and striker plate. Adjustment of the deck lid is obtained by loosening the bolts and shifting the lid from side to side or front to rear. It is often possible, however, to properly fit the deck lid by adjusting the striker plate, latch or both.

42. DECK LID HINGES

Removal

The deck lid hinge is fastened to the deck lid by two bolts at each hinge. The bolt holes are slotted and slightly oversize to permit fore-and aft adjustment of deck lid.

Should it become necessary to remove and install either of the rear deck lid hinges, for repair or complete replacement, refer to Figures 10 and 11 and proceed as follows:

(1) Raise the deck lid and brace the lid on the corner where the hinge is to be removed.

(2) Remove the torsion bar (or springs) from the side on which the hinge is to be removed.

(3) Remove the bolts that hold the deck lid to the hinge arm.

(4) Remove the spring nut that holds the hinge pivot on the support bracket.

(5) Disengage the hinge from the bracket and remove it from the rear compartment.

Installation

(1) Slide the hinge into position in the trunk compartment and install the hinge spring nut.

(2) Install the bolts that hold the hinge to deck lid. Do not tighten, just snug down.

(3) Remove the prop and lower the lid to test fit.

(4) Make necessary adjustments to center the lid in opening. Also, test adjustments of latch and striker plate. After adjustments have been made, prop the lid open and install the torsion bar or springs as necessary.

43. DECK LID TORSION BAR REPLACEMENT

(1) Using holding Tool C-3449 installed on torsion bar, pry torsion bar out of the adjustment slots (Fig. 12).

(2) Unwind the torsion bar.

(3) Unhook the torsion bar from the support bracket.

(4) Push the torsion bar out of the roller in the hinge arm and remove the torsion bar from the hinge support.

(5) To install the torsion bar, insert the bar into the hinge support.

(6) Insert the end of the torsion bar into roller in hinge arm.

(7) Hook the torsion bar into the support bracket.

(8) Using holding Tool C-3449 wind the torsion bar and insert one end of the bar into first adjusting slot.

(9) Place the deck lid in various opening positions and test tension of torsion bars.

(10) Adjust the torsion bars progressively until the deck lid stays in the open position.

44. DECK LID LOCK ADJUSTMENT

Vertical adjustment of the deck lid lock is made at the lock attaching screws (Fig. 14). The side adjustment is made at the deck lid striker attaching bolts.

45. DECK LID LOCK CYLINDER

The deck lid lock cylinder is retained in the deck lid by a spring steel "U" shaped clip attached from within the deck lid.

46. WINDSHIELD

Removal (Plymouth)

(1) Cover the cowl, hood and fender area with a protective coating.

(2) Remove the inside windshield glass opening garnish mouldings.

(3) Remove the "A" post outside chrome mouldings.

(4) Remove the windshield lower mouldings and moulding center cap using a fibre wedge (Fig. 45).



Fig. 45—Removing Windshield Lower Moulding

(5) Remove the windshield upper moulding using a fibre wedge.

(6) Unlock the windshield weatherstrip by prying the lip of the weatherstrip apart, inserting a fibre wedge, and with a slight twist to the wedge unlock the weatherstrip by moving the tool around the weatherstrip.

(7) Carefully loosen the weatherstrip from the windshield inner and outer sides.

(8) With an assistant supporting either end of the windshield, exert pressure to force the windshield out of the weatherstrip and carefully remove the windshield from the vehicle.

Installation (Plymouth)

Before installing the windshield, inspect the windshield fence for burrs, high spots or bends. Correct these conditions before installing the weatherstrip.

(1) Place the windshield in position on the cowl.

(2) With an assistant, slide the upper edge of the glass into the channel of the weatherstrip.

(3) Pound the glass, with the palm of the hand, using an upward motion, until the glass is fully seated in the channel of the weatherstrip at the top, bottom and sides of the glass.

After properly seating the glass in the weatherstrip, use a wedge shaped tool of hardwood or fibre (Fig. 46) inserted between the weatherstrip and glass at either corner to strip the glass into weatherstrip. Slide the tool across the top, bottom, and around the sides of the weatherstrip to properly seat the glass in place. After sealing the glass in the weatherstrip, use a suitable tool over the locking strip with enough pressure to force the fold into the locked position. **Always work the tool across the top, down each side and over the bottom.**



Fig. 46—Seating Windshield in Weatherstrip

(4) Seal the weatherstrip.

(5) Align and install the upper windshield chrome moulding over the top of windshield. **Make sure to exert sufficient pressure on center of moulding to force moulding all the way down on clips.**

(6) Align and install the lower center chrome mouldings. Install the lower mouldings center clip.

(7) Install the "A" post mouldings. Be sure the mouldings overlap the outer edges of the lower windshield mouldings.

(8) Install the windshield wiper arms and blades.

(9) Install the windshield inner garnish mouldings.

(10) Clean the windshield using the recommended solvent, then test for water leaks.

(11) Operate the windshield wipers and adjust as necessary.

Removal (Valiant)

(1) Place a protective covering over the cowl, hood and fender area next to the windshield.

(2) Remove the windshield wiper arms and blades.

(3) Starting at the joint of the trim at the bottom center of the windshield, pry out the edge of the strip and pull the mylar trim strip from the rubber.

(4) Insert the tapered end of a fibre stick between the weatherstrip and the glass and work the weatherstrip from the glass.

(5) With an assistant, apply hand pressure to the upper side corner of the glass and push the glass out from the windshield opening.

(6) Remove the windshield weatherstrip from the body flange if found to be distorted, cut or torn. Inspect the flange (fence) for bends and rough surfaces, repair as required.

Installation

(1) If the weatherstrip was removed, remove all sealer and foreign material from the fence. Apply a small bead of weatherstrip cement in the body flange groove of the weatherstrip.

(2) Carefully position the new weatherstrip over the body flange, making sure it fits smoothly and evenly over the entire flange especially at the corners.

(3) Coat the groove of the weatherstrip with mineral spirits.

(4) With an assistant, insert the top edge of the glass into the weatherstrip.

(5) Holding the glass centered in the opening, insert the fibre wedge in the groove of the weatherstrip and strip in the glass. Bump the glass into position with the palm of the hand. Make sure the glass is properly seated and centered in the body opening.

(6) Air dry the weatherstrip and apply weatherstrip cement between the glass and weatherstrip.

(7) Use mineral spirits as a lubricant and a fibre wedge or other suitable tool and install the mylar trim into the rubber. Start at the lower center of the window and trim the strip to length after it is fully inserted around the window.

(8) Remove the protective covering.

47. REAR WINDOW (Plymouth)

Removal (All Models Except Two Door Hard Top)

(1) Cover the rear deck, rear window and quarter panel areas with protective covering.

(2) Remove the chrome moulding end and center caps.

(3) Remove the side, lower and top weatherstrip mouldings.

(4) Use a fibre wedge to unlock the weatherstrip. After unlocking the weatherstrip, slide the tool up and completely around the weatherstrip to unlock the lip.

(5) Loosen the weatherstrip from the rear window (Fig. 47).

(6) Remove the glass by pushing on the glass from the inside.

(7) Use of gloves will protect hands against possible sharp edges.



Fig. 47—Unlocking Weatherstrip from Rear Window Glass

Installation

(1) Lubricate the weatherstrip groove with the soap solution.

(2) Position the glass at the lower outside corners.

(3) Work the lip of the weatherstrip over the glass along the lower edge.

After the glass is centered along the top and the lower corners, work the lip of the weatherstrip over the lower edge of the glass.

Make sure the glass is properly seated by tapping the glass with the palm of hand. **Do not use a rubber mallet when installing rear window glass.**

(4) Lay a bead of sealer in the weatherstrip groove all around the rear window.

(5) Brush the soap solution on the locking strip.

(6) Starting at the center of the upper edge, lock the top edge and the sides. Lock the lower edge last.

(7) Lubricate the upper groove in weatherstrip with the soap solution and install the upper, lower, and side mouldings.

(8) Install the upper and lower center moulding clips and the side moulding caps.

(9) Reseal the glass and test for water leaks.

Removal (Two Door Hard Top—Plymouth) (Fig. 48)

(1) Place a protective covering over the deck lid, quarter panel and rear window areas.

(2) Using a fibre wedge, loosen the weatherstrip from the rear window fence, both inside and outside lips.

(3) With an assistant steadying the glass on the outside, push against the glass at one of the upper corners, from inside the car, and remove the glass and weatherstrip from the fence. **Gloves should be worn as a precautionary measure.**

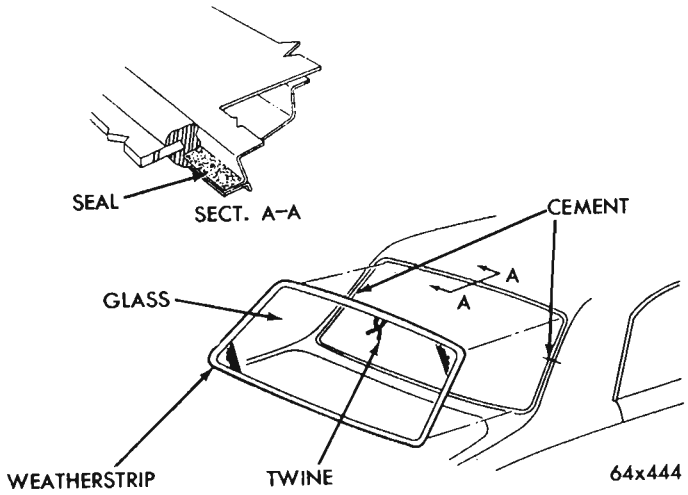


Fig. 48—Rear Window Installation

(4) Place the glass on a cloth covered bench and carefully remove the weatherstrip from the glass.

(5) Remove all sealer from the glass, weatherstrip and rear window fence.

Installation (Two Door Hardtop) Plymouth

(1) Inspect the rear window fence to be certain it is clean, smooth and straight.

(2) Flow a continuous ribbon of cement on each lip and around the entire length of the glass groove of the weatherstrip (Fig. 48).

(3) Install the weatherstrip on the rear window.

(4) Install twine into the groove of the weatherstrip that seats on the rear window fence.

(5) The ends of the twine should be at the top center section of the weatherstrip (Fig. 48).

(6) With an assistant, position the rear window glass and weatherstrip in the rear window opening.

(7) With an assistant holding the glass in position, enter the car and pull the twine slowly to seat the weatherstrip on the fence.

(8) With the palm of the hand, tap the rear window glass to make certain it is fully seated.

(9) Seal the weatherstrip to fence areas, on the outside only. Remove all excess sealer.

Removal (Valiant)

(1) Starting at the bottom of the rear window, pry out the mylar trim strip from the weatherstrip.

(2) Insert the fibre strick between the weatherstrip and the glass and strip the weatherstrip from the glass.

(3) With an assistant holding the glass, push out the glass from either upper corner of the body opening.

(4) Remove the rear window weatherstrip from the body flange if found to be distorted, cut or torn. Test the flange (fence) for bends and rough surfaces, repair as required.

Installation

(1) If the weatherstrip was removed, remove all old sealer from the flange. Apply a small bead of weatherstrip cement in the body flange groove of the weatherstrip.

(2) Carefully position the weatherstrip over the body flange, making sure it fits smoothly and evenly over the entire flange especially at the corners.

(3) Coat the channel of the weatherstrip with mineral spirits.

(4) Center the glass in the opening and insert the top edge of the glass into the top channel of the weatherstrip.

(5) Using a tapered fibre stick, work the weatherstrip over the edge of the glass. Bump the glass into place with the palm of the hand.

(6) Air dry the weatherstrip.

(7) Apply weathersealing compound between the glass and weatherstrip.

(8) Use mineral spirits as a lubricant and a fibre wedge or other suitable tool and work the trim strip into the rubber.

(9) Clean all excess sealer from the rear window glass.

48: DOOR VENTILATOR ASSEMBLY

Removal (4 Door Sedan)

(1) Remove the arm rest, inside handles, remote control lock knob, trim panel and the water shield.

(2) Disengage the lower end of the division bar from the adjusting bracket (Figs. 41 and 42.)

(3) Remove the two attaching screws from the forward and top edge of the door frame.

(4) Remove the two vent frame attaching screws from the base of the vent frame.

(5) With the door glass in **"down"** position, tilt the vent frame to the rear and withdraw the vent frame assembly up out of the door.

Installation

(1) With the door glass in the **"down"** position, tilt the vent frame assembly to the rear and insert the division bar and vent assembly into the door.

(2) Install the two lower vent frame attaching screws finger tight.

(3) Install the two vent frame attaching screws in the forward and top edge of the door frame.

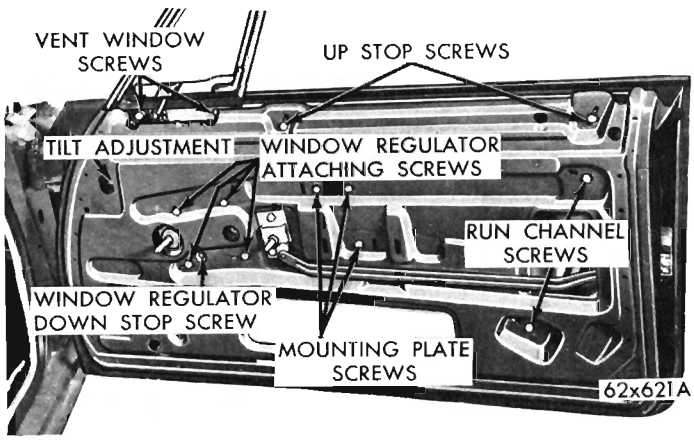


Fig. 49—Door Component Attaching Points (Two Door Hard Top)

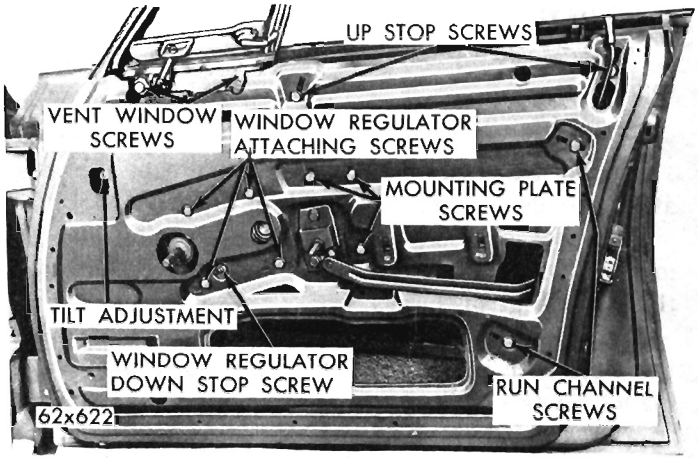


Fig. 50—Door Component Attaching Points (Four Door Hard Top)

(4) Tighten the vent frame lower attaching screws.

(5) With the door glass in the **"down"** position attaching the lower end of the division bar to the adjusting bracket.

(6) Operate the door glass and inspect for ease of operation and alignment of the division bar.

Removal (Hardtop Models)

(1) Remove the arm rest, inside handles, remote door lock knob, trim panel and water shield.

(2) With the door glass in the **"down"** position disengage the division bar from the lower adjusting bracket (Figs. 49 and 50).

(3) Remove the lock nut of the tilting adjusting screw and turn the adjusting screw clockwise to disengage the screw from the door frame bracket.

(4) Remove the two attaching screws from the base of the vent frame.

(5) Tilt the vent frame to the rear and remove the vent frame assembly up and out of the door.

Installation

(1) With the tilt adjusting screw bottomed in the vent frame and the door glass down, insert the vent frame into the door.

(2) Turn the tilt adjusting screw counter-clockwise and engage it into the bracket of the door.

(3) Install the two attaching screws in the base of the vent frame finger tight.

(4) Attach the lower end of the division bar to the adjusting bracket.

(5) Refer to Figures 43 and 44 for vent frame adjustment.

(6) Install the water shield, trim panel, inside door handles, arm rest and the remote door lock knob.



Fig. 51—Glass Run Channel

49. DOOR GLASS RUN CHANNEL

Removal (4 Door Sedan)

The door glass run channel is held in place by its own expansion in the door frame.

(1) With the door glass in the down position pry the top of the run channel down, and out of the door frame.

(2) Pull the balance of the run channel up and out of the door frame.

Installation

(1) Insert the run channel down into the rear of the door frame and align the end of the channel with the end of the channel frame and press the channel firmly into place.

(2) Work the channel tightly into the sharp corner of the door (Fig. 51).

(3) Work the balance of the channel into the door frame.

(4) Using Mopar All Purpose Cement, install the water shield, trim panel, inside handles, arm rest and the door lock knob.

50. FRONT DOOR GLASS

Removal (Plymouth) (4 Door Sedan and Station Wagon)

(1) Remove the inside door handles, arm rest, remote lock knob, trim panel and the water shield.

(2; With the glass in the **"down"** position, insert a screw driver under the retainer ring and pry the retainer from both regulator arm studs.

(3) Remove the leather washers from the regulator arm studs, then pull the regulator arm studs from the glass lower channel.

(4) Loosen the division bar and front run channel mounting bolts.

(5) Move the division bar downward and disengage from the door glass.

(6) Move the glass forward between the division bar and the inner door pane and remove the glass up and out of the door glass opening.

Installation (Plymouth) 4 Door Sedan and Station Wagon

(1) Insert the door glass down into the door frame.

(2) Lubricate the slides of the glass lower channel with lubriplate.

(3) Insert the glass into both front and rear run channels.

(4) Insert the regulator studs into the slides of the glass lower channel.

(5) Install the leather washers and new retaining clips on the ends of the studs.

(6) Locate the run channel anchor and adjusting screw into the door bracket and tighten the lock nut.

(7) Using Mopar All Purpose Cement install the water shield, trim panel, inside handles, arm rest and remote lock button.

Removal (Hardtops and Convertibles)

(1) Remove the inside handles, arm rest, remote lock knob, trim panel and the water shield.

(2) Place the glass in the **"down"** position and insert a screw driver under the retainer ring and pry the retainer off of both regulator arm studs.

(3) Remove the leather washers from the regulator arm studs, then pull the regulator studs from the glass lower channel.

(4) Remove the two "up" stops.

(5) Remove the door glass up through the door frame by tilting the glass slightly.

Installation (Hardtop and Convertible)

(1) With the glass tilted slightly to the rear, insert the glass into the front and rear run channel and lower the glass down into the door.

(2) Lubricate the slides of the glass lower channel.

(3) Insert the regulator arm studs into the slides of the glass lower channel.

(4) Place the leather washers over the regulator arm studs and install new retaining clips.

(5) Install the two "up" stops and adjust as necessary.

(6) Using Mopar All Purpose Cement, install the water shield, trim panel, inside door handles, arm rest and the remote lock knob.

Removal (Valiant Sedan Models)

(1) Remove the door interior trim and hardware.

(2) Loosen the front run channel lower mounting screws.

(3) Move the run channel forward and slide the glass out of the channels.

(4) Remove the regulator arm from the lift bracket channel.

(5) Remove the glass from the door.

Installation (Valiant Sedan Models)

(1) Before installing the glass, lubricate the regulator slide of the lower glass channel with lubriplate.

(2) Position the glass into the door frame.

(3) Position the regulator arm roller into the lift bracket channel.

(4) Position the glass into the glass run channels and adjust the door glass.

(5) Install the door interior trim and hardware.

51. GLASS LIFT BRACKET REPLACEMENT

To separate the lift bracket (Fig. 52) from the glass, just push the plug out of the rivet. Next, pinch the expandable ends of the rivet together and push the rivet out of the glass. Save the plastic rivet and plug and re-use.

To assemble the bracket to the glass, line up the holes in the glass, gasket and lift bracket. Push the plastic rivet through from the lift bracket side.

Just make sure that the head of the plastic rivet is tight against the bracket and the expandable end of the rivet is all the way through the hole in the glass. Then drive the plug into the rivet to lock the rivet in place.

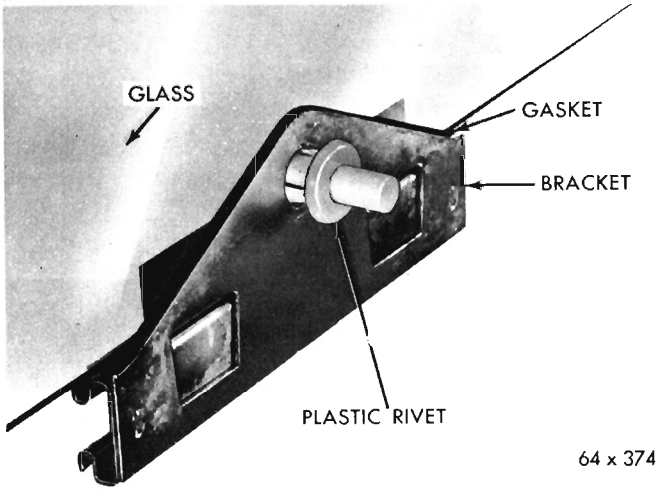


Fig. 52—Glass Lift Bracket

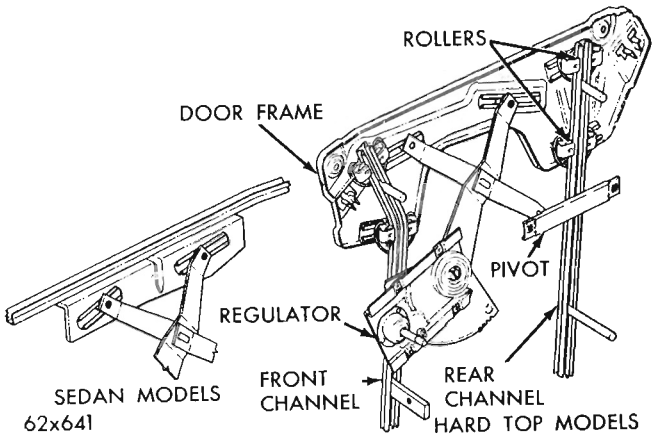


Fig. 53—Rear Door Window Regulator

52. REAR DOOR WINDOW REGULATOR

Removal (Fig. 53)

(1) Remove the arm rest.

(2) Remove the inside door handle and regulator handle.

(3) Remove the plastic knob from the door lock rod.

(4) Remove the door trim panel.

(5) Carefully remove the door water shield.

(6) Remove the door window stops.

(7) Disconnect the door glass from the window regulator and remove the door glass assembly.

(8) Remove the glass front and rear channels.

(9) Remove the regulator attaching screws and remove the regulator assembly.

Installation

(1) Lubricate all moving parts of the regulator assembly with lubriplate.

(2) Position the regulator assembly into the door and install the attaching screws.

(3) Install the glass front and rear channels.

(4) Install the door glass and the glass stops.

(5) Operate the window regulator assembly and test for ease of glass movement and alignment.

(6) Install the door water shield.

(7) Install the trim panel, arm rest, door handle, regulator handle and lock rod plastic knob.

53. REAR DOOR GLASS (4 Door Hard Top)

Removal

(1) Remove the door arm rest, regulator handle, remote control handle, lock rod plastic knob, trim panel and water shield.

(2) Remove the door glass stops.

(3) Disconnect the regulator arms from the glass channel and remove the glass assembly.

(4) Roll the glass to the closed position and test the alignment.

(5) Install the water shield, trim panel, arm rest and the other inside hardware.

54. REAR DOOR GLASS (Plymouth Sedan Models)

Removal

(1) Remove the rear door arm rest, trim panel and inside door hardware.

(2) Remove the door water shield.

(3) Lower the window and disconnect the regulator arms from the glass channel.

(4) Remove the door glass upper stop.

(5) To remove the door glass, it is necessary to pivot the glass upward at the front end of the glass to free it from the glass run channels.

(6) After the glass has been freed from the glass run channels, pull the glass up and out of the door opening.

Installation

(1) Slide the door glass down into the door, rear portion of glass first and position the glass into the glass run channels as it is pivoted into place.

(2) Connect the regulator arms to the glass channel.

(3) Lubricate the regulator roller area on the glass channel with lubriplate.

(4) Install the door glass upper stop.

(5) Operate the door glass and test for ease of operation and for correct alignment.

(6) Install the door water shield.

(7) Install the door trim panel, arm rest and inside door hardware.

55. REAR DOOR STATIONARY GLASS (Valiant Sedan and Station Wagon Models)

Removal

(1) Remove the door interior hardware, trim panel and water shield.

(2) Lower the glass.

(3) Remove the upper and lower division bar attaching screws (Fig. 54).

(4) Remove the division bar from the door.

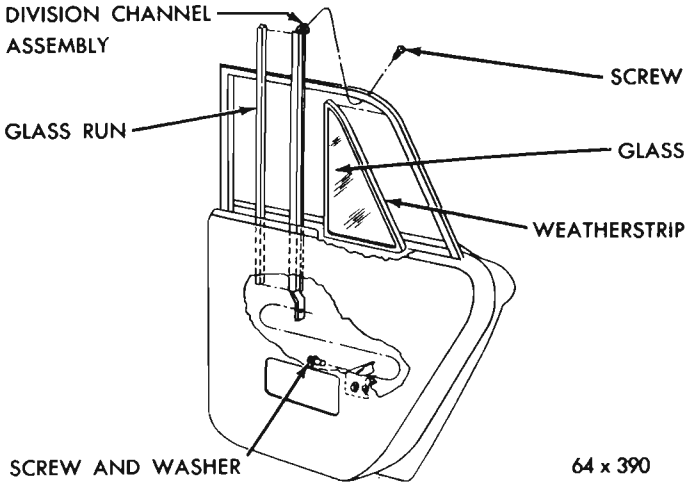


Fig. 54—Rear Door Stationary Glass (Valiant)

(5) Move the stationary glass rearward to disengage it from the weatherstrip and remove the glass from the door.

Installation

(1) Inspect the condition of the stationary glass weatherstrip and replace if necessary.

(2) Slide the stationary glass into the weatherstrip. Make sure it is fully installed.

(3) Install the division bar and adjust as necessary.

(4) Install the water shield, trim panel and hardware.

56. REAR DOOR GLASS RUN CHANNELS (Four Door Hard Top)

Removal—Front Channels

(1) Remove the door inside hardware trim panel.

(2) Carefully remove the water shield.

(3) Remove the rear door glass stops.

(4) Disconnect the regulator arms from the glass channel and remove the door glass.

(5) Remove the nuts attaching the glass run channel to their mounting brackets and remove the rear glass run channel up through the top of the door.

Installation

(1) Insert the glass run channel into the door and on their respective mounting brackets. Install the mounting nuts.

(2) Slide the glass into the door and connect the regulator arms to the glass channel.

(3) Install the glass stops.

(4) Test the operation and alignment of the door window.

(5) Install the door water shield.

(6) Install the door trim panel, arm rest and the other inside door hardware.

Removal Rear Channel

(1) Remove the door trim panel, arm rest and inside door hardware.

(2) Carefully remove the door water shield.

(3) Remove the door window stops and window.

(4) Remove the nuts attaching the glass run channel to their mountings and pull channel straight up out of the door to remove.

Installation

(1) Slide the glass run channel into the door and position the channel on its mountings. Install the retaining nuts.

(2) Slide the door glass down into the door and connect the regulator arms to the glass channel.

(3) Test the operation and alignment of the door glass.

(4) Install the door water shield.

(5) Install the door trim panel, arm rest and the inside door hardware.

57. REAR DOOR LOCK AND LINK ASSEMBLY

Removal (Fig. 38)

(1) Remove the plastic knob from the top of the door lock rod.

(2) Remove the door trim panel, arm rest and inside door hardware.

(3) Remove the door water shield.

(4) Lower the window to the full open position.

(5) Remove the screws attaching the locking control to the door.

(6) Disengage the door lock control link from the rear door lock assembly.

(7) Remove the door lock control rod.

Installation

(1) Lubricate all moving parts of the door lock link assembly with lubriplate.

(2) Slide the link assembly down into the door and connect the lock control link to the lock assembly.

(3) Position the locking control to the door panel and install the attaching screws.

(4) Test the operation of the door lock assembly and

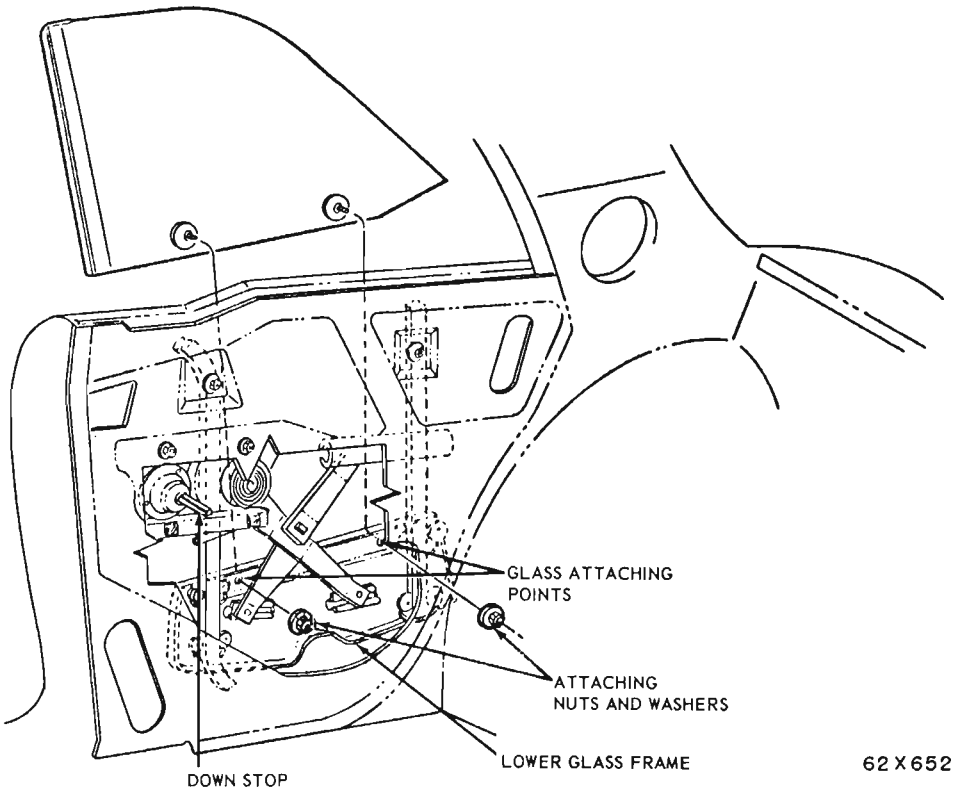


Fig. 55—Quarter Window Attaching Points (Sedan Shown)

if satisfactory, install the door water shield.

(5) Install the door trim panel, arm rest, door lock arm control knob and inside door hardware.

58. QUARTER GLASS (All Models Except Station Wagon and Valiant Two Door Hard Top Models)

Removal (Fig. 55)

(1) Remove the rear seat cushion.

(2) Remove the rear seat back.

(3) Remove the quarter glass handle, escutcheon, arm rest, trim panel and water shield.

(4) Remove the two retaining clips from the studs of the lower frame and roller assembly.

(5) Disengage the quarter glass from the lower frame.

(6) Remove the glass up through the quarter panel.

Installation

(1) Insert the quarter glass down through the quarter panel.

(2) Engage the glass onto the lower frame and install new retaining clips.

(3) Lubricate the rollers and run tracks and inspect for alignment of track and ease of operation.

(4) Install the water shield, trim panel, escutcheon, handle and the arm rest.

(5) Install the rear seat back and the rear seat cushion.

Removal (Fig. 56) (Valiant Two Door Hard Top)

(1) Remove the rear seat cushion and back.

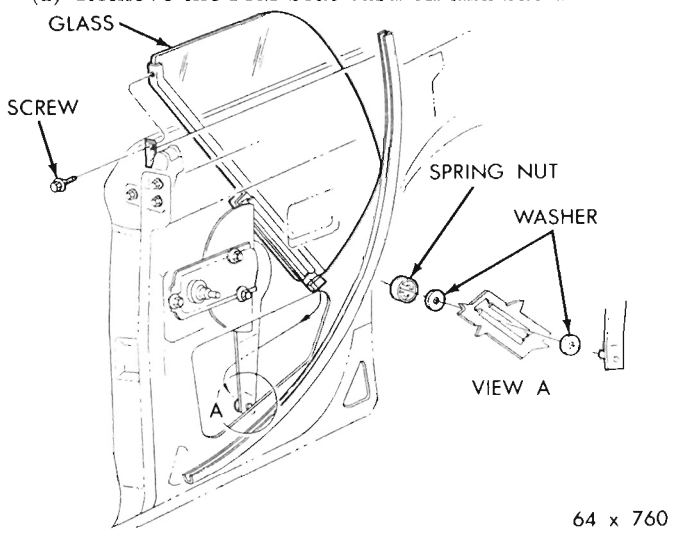


Fig. 56—Quarter Window Attaching Points (Valiant Two Door Hard Top)

(2) Remove the regulator handle, trim panel and water shield.

(3) With the glass lowered two-thirds of the way, remove the screw and washer from the hinge assembly.

(4) Lower the glass fully and remove the spring nut and washer attaching the regulator stud to the glass lower channel.

(5) Remove the regulator stud from the glass lower channel.

(6) Remove the glass and lower channel assembly.

Installation (Valiant Two Door Hard Top)

(1) Position the glass into the quarter panel.

(2) With the regulator in the down position, insert the regulator arm stud into the glass lower channel and install the washer and spring nut.

(3) Raise the glass one-third and install the hinge to the glass lower channel.

(4) Test the operation and alignment of the quarter glass.

(5) Install the water shield, trim panel, regulator handle and rear seat assembly.

59. QUARTER GLASS TRACK

Removal

(1) Remove the rear seat cushion and seat back.

(2) Remove the regulator handle, escutcheon, arm rest, trim panel and the water shield.

(3) With the window in the down position, remove the retaining clips from the studs of the lower frame.

(4) Disengage the glass from the lower frame and

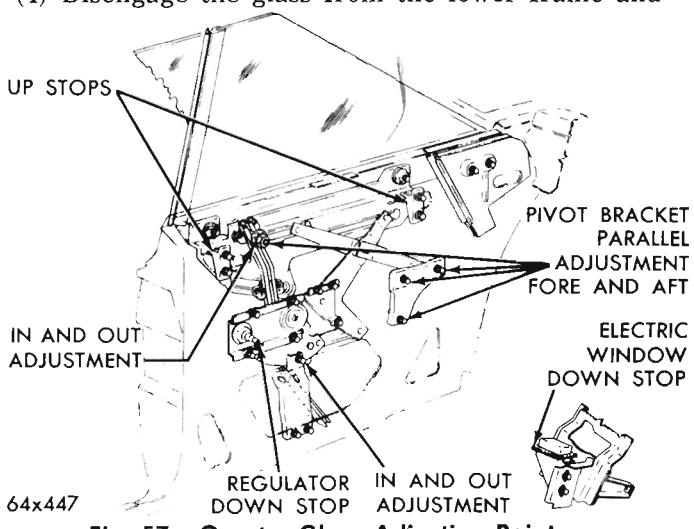


Fig. 57—Quarter Glass Adjusting Points (Plymouth Hard Top)

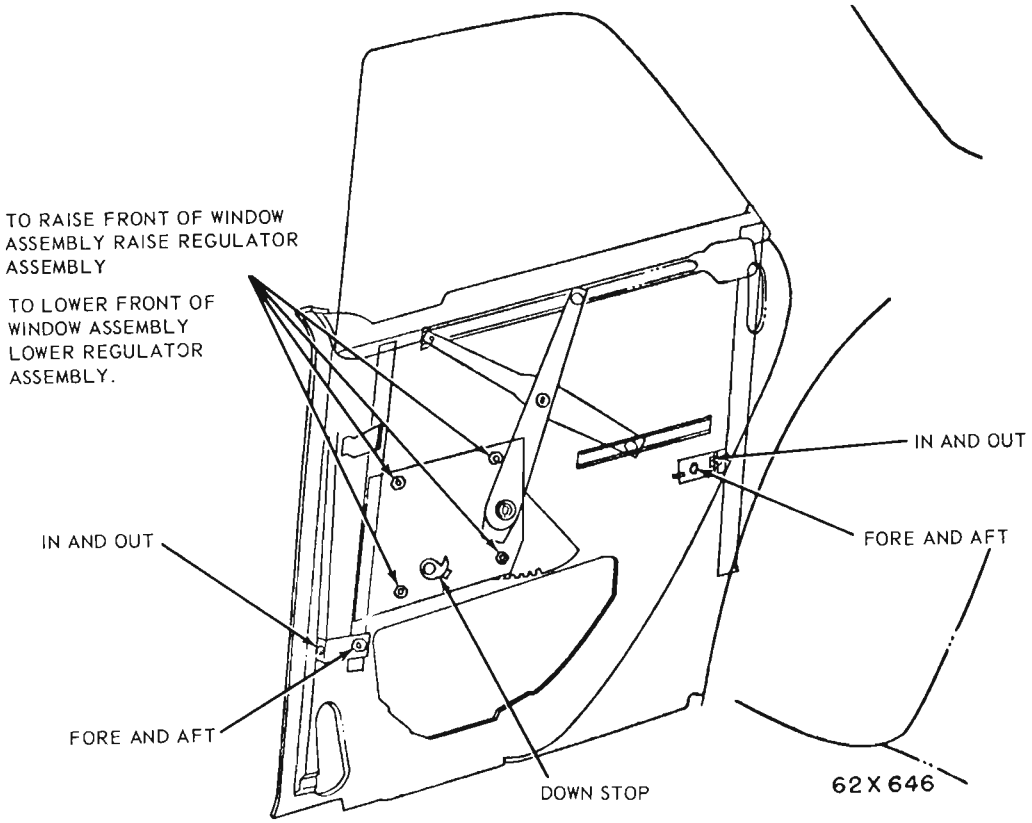


Fig. 58—Quarter Glass Adjusting Points (Plymouth Sedan)

remove the glass from the quarter panel.

(5) Raise the lower frame and rollers and disengage the regulator arms from the frame.

(6) Pull the frame up off the track.

(7) Scribe aligning marks on the lower track bracket and remove the lower track attaching screws. (Figs. 56, 57, 58 and 59.)

(8) Remove the track upper sleeve nuts and remove the track from the quarter panel.

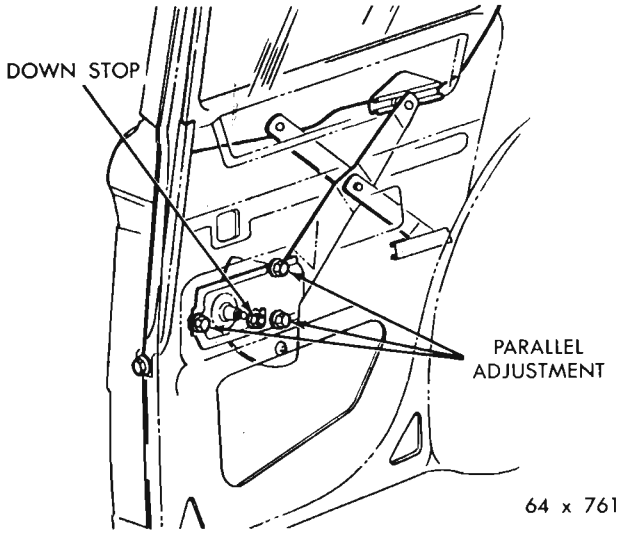


Fig. 59—Quarter Glass Adjusting Points (Valiant Hard Top)

Installation

(1) Position the tracks down in the quarter panel.

(2) Align the lower attaching screw scribe marks and install the screws.

(3) Install the upper track attaching nuts.

(4) Lubricate the track and rollers and engage the lower frame and rollers on the track.

(5) Engage the frame and roller assembly to the regulator arms.

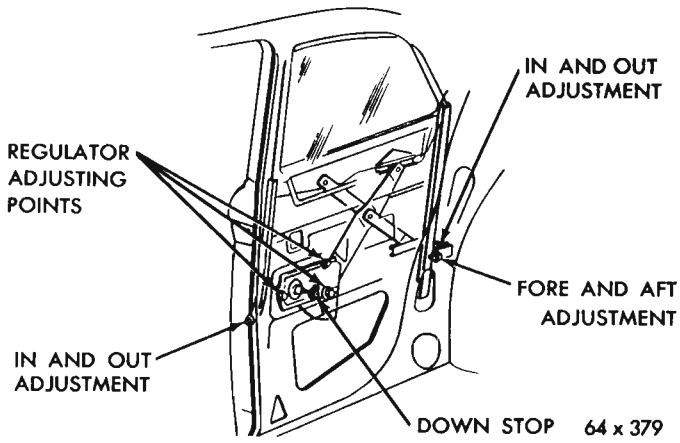


Fig. 60—Quarter Glass Adjusting Points (Valiant Sedan)

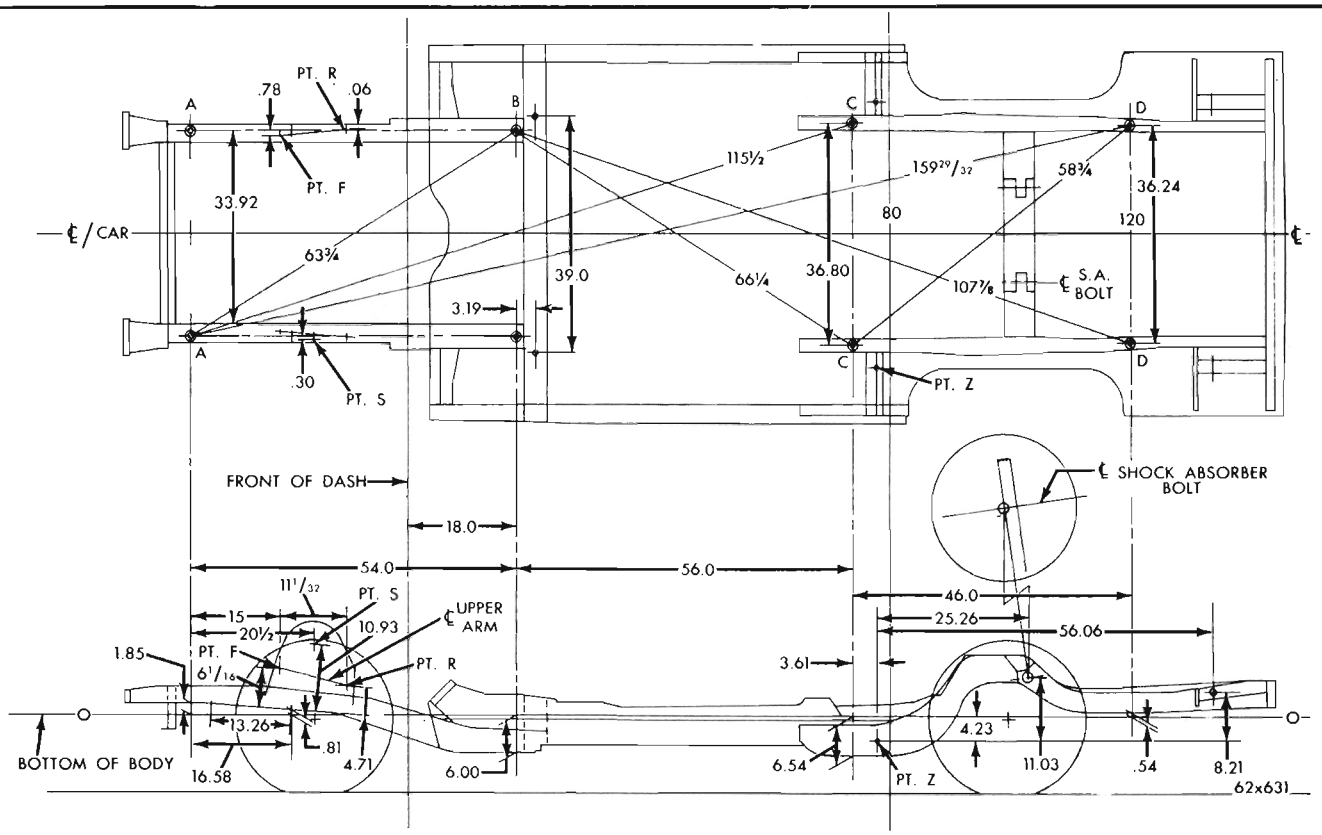


Fig. 61—Under Body Dimensions (Plymouth)

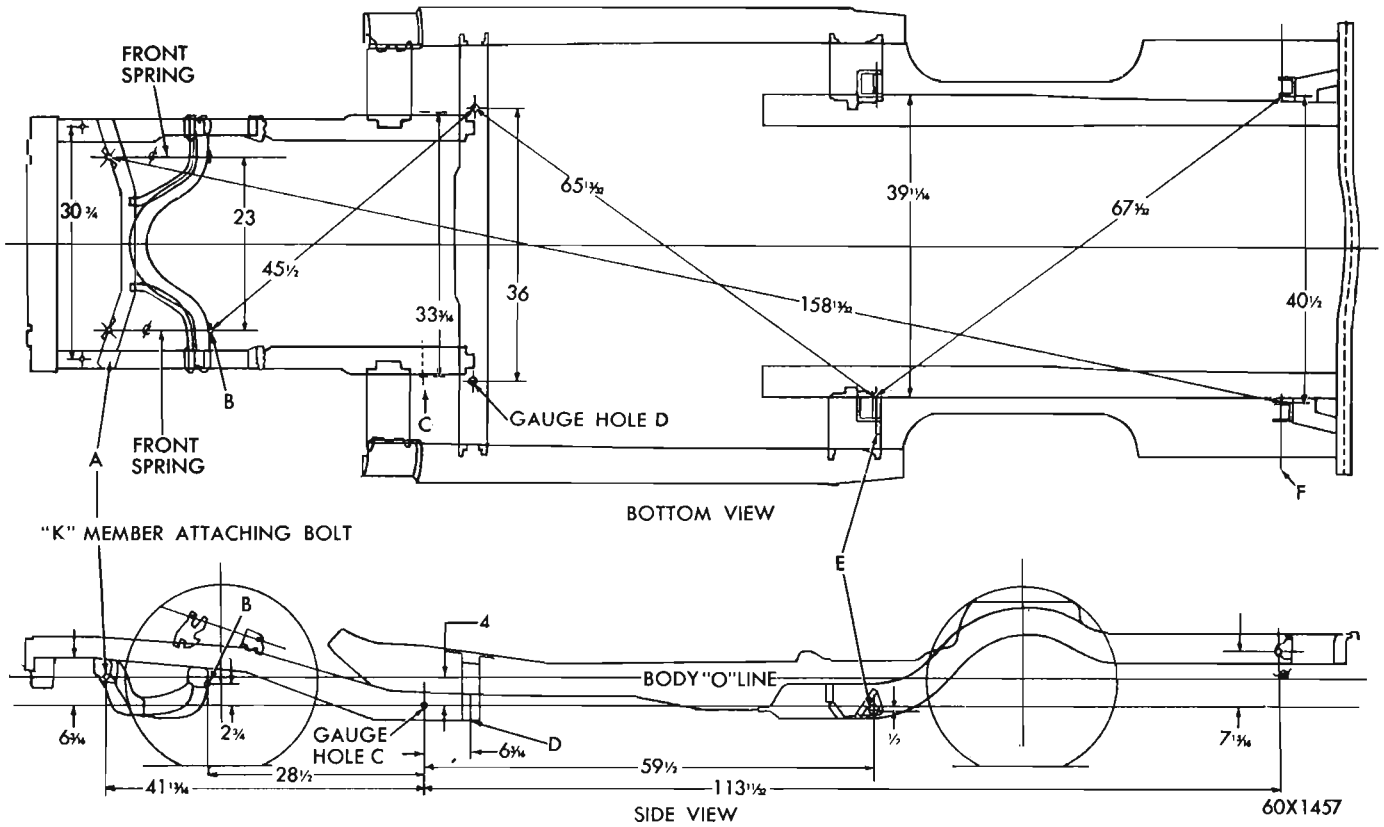


Fig. 62—Under Body Dimensions (Valiant)

(6) Place the frame and roller assembly in the **"down"** positions.

(7) Lower the glass and install it on the studs of the lower frame.

(8) Install new retaining clips on the studs.

(9) Refer to (Figs. 57, 58, 59 and 60) and adjust the glass and track.

(10) Install the water shield, trim panel, escutcheon handle, arm rest, seat back and the seat cushions.

60. QUARTER GLASS REGULATOR

Removal

(1) Remove the seat cushion, seat back, arm rest, handle and escutcheon, trim panel and the water shield.

(2) Remove the pivot slide attaching screws and remove the slide from the pivot.

(3) Remove the regulator arms from the lower frame.

(4) Prop the window in the **"up"** position.

(5) Remove the regulator down and out of the quarter panel.

Installation

(1) Place the regulator up into position and install the attaching screws.

(2) Insert the regulator arms into the lower frame runs.

(3) Place the pivot slide on the pivot arm and install the attaching screws finger tight.

(4) Adjust the pivot slide and tighten the attaching screws.

(5) Install the weather shield, trim panel, arm rest, escutcheon and handle, seat back and the seat cushion.

61. BODY ALIGNMENT (Figures 61 and 62)

Body alignment may be accurately measured by the following method. Elevate the vehicle to a level position on a clean and smooth floor.

Refer to (Figs. 63 and 64) and place the line of a plumb-bob on point "A" with the plumb-bob just contacting the floor. Mark the plumb-bob contact point on the floor. Repeat the process at points B, C, D, E and F at both sides of the body. Snap a chalk line between points as illustrated.

Compare dimensions with specifications, all matching point-to-point dimensions should agree within ¼ inch. **Care should be taken that all diagonals compared represent corresponding check points.**

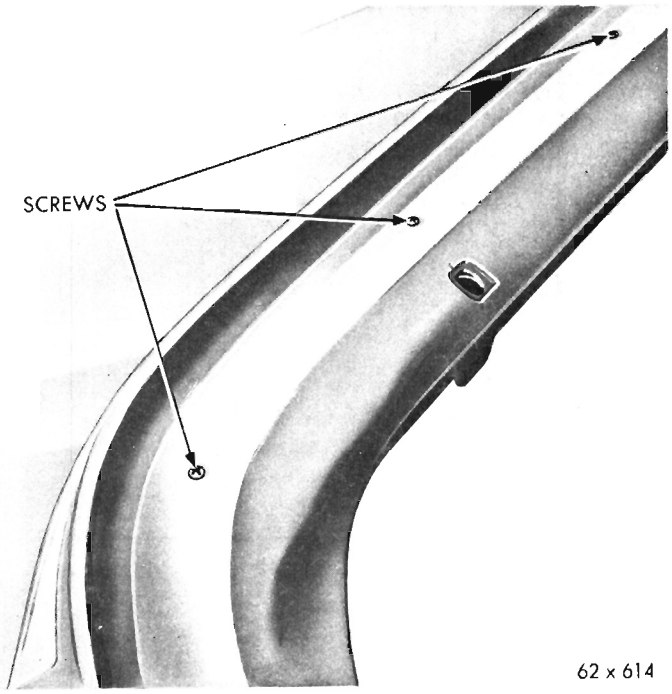


Fig. 63—Header Moulding Attachment

Upper body alignment may be measured by diagonal measurements from various points of the door opening sills to the roof rail of the opposite side of the body. Equal dimensions of these check points made at both sides of the body will assure proper body alignment.

62. REPLACEMENT OF BODY PANELS

When repairing accident damage it may be found advisable to replace damaged panels. The sturdy reinforced box sections ahead of the cowl will be of vital concern as they carry the suspension load and engine support. All body and underbody dimensions

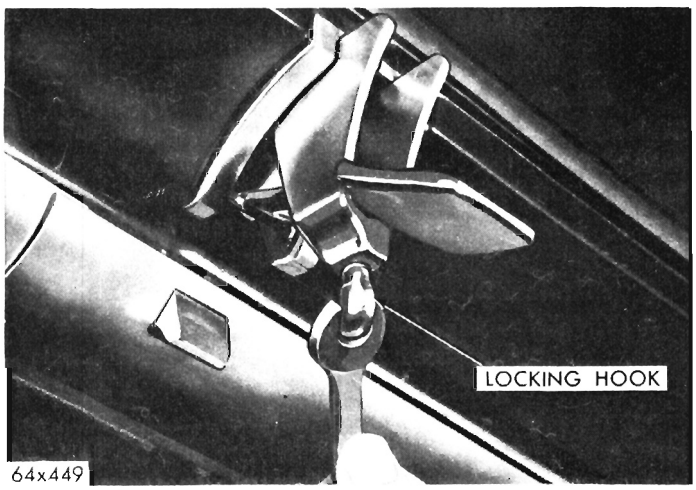


Fig. 64—Adjusting the Latching Mechanism Hooks

should be measured before any of the body panels are removed for replacement.

With unitized body construction, it may be advisable to measure body alignment in the event of extensive collision damage.

The box sections of the body are also of vital concern. The door pillars, sills, roof rails, rear window and windshield headers provide added strength to assist the lower body reinforcing members.

Jacking or stretching equipment should be used to bring the body dimensions back to specifications before damaged body panels or sub-assembly parts are removed. Separation of damaged panels may be accomplished by drilling cutting the spot welds with a chisel. Welded seams may be separated with the aid of a cutting torch or grinder.

When replacing large panels requiring long welds, care should be taken to prevent distortion due to excessive heat. Spot weld the panel at the center of the joint and tack weld toward each end. Alternately tack welding approximately 12 inches apart. Wet asbestos putty surrounding the weld will help prevent heat distortion. Make certain that sufficient welds are applied to maintain the original strength.

63. REMOVING OLD FINISH

The old finish is usually removed by grinding. A No. 16 open coat grinding disc removes paint with a minimum clogging of the paper. The exposed metal should be sanded with No. 50 paper then followed with No. 220 paper and all edges of the paint film should be feather edged with No. 320 and finished with No. 400 wet and dry paper.

On large areas and complete panels it is sometimes more efficient to use paint remover. Be sure to select a paint remover that is water neutralizing.

Sand blasting is an excellent method of removing paint, particularly on complete refinish jobs. When sand blasting it is advisable to remove all mouldings and trim. Thoroughly mask all glass.

A vibrating feather edger may also be used to finish small areas or panels.

After the metal has been properly sanded it should be thoroughly washed with a good wax and grease remover.

CAUTION: After the metal has been cleaned do not rub the metal with bare hands as the normal oil of the skin may leave a thin film on the metal and cause poor adherence or peeling.

64. PAINT REFINISHING

Plymouth and Valiant vehicles are finished with a Luster-Bond Super Enamel. These super enamels provide the utmost in appearance and durability.

To repair individual or small panels, an air dry or low bake enamel has been developed and has the same characteristics of appearance and durability as the original baked enamel. Repainting a complete fender, door or body panel is recommended and will be found to be more satisfactory than to try and do a touch up on a large surface.

The use of lacquer for spot painting will usually prove unsatisfactory as the sheen or gloss of lacquer and enamel do not match. Lacquer has a tendency to oxidize and fade over long exposures to weather. The finished paint job will be no better than the surface that it covers. Therefore, particular attention should be paid to the priming and surfacing of the metal. It is advisable to apply two or three medium coats of primer rather than one heavy coat. This will reduce the drying time between coats. Use No. 320 or 360 paper and sand each coat to remove any blemishes or scratches. Finish the last coat with No. 400 wet paper.

65. DARK SPOTS APPEARING ON PAINT (Polychromatic)

This condition can be caused by foreign particles that are carried through the air and settle on the flat surfaces of the paint.

If any of this foreign substance, containing acid-like particles, is allowed to remain on the paint for any length of time, it may result in a spotting condition. This spotting condition is caused by the reaction of such particles with the aluminum, used in all polychromatic paints, causing the aluminum, flakes to disappear, leaving the base color. **These same acid-like particles can also attack a non-metallic paint, but it will usually result in an etched condition rather than a discoloration.**

In view of the foregoing, it is advisable to wash vehicles frequently to prevent the possibility of such conditions occurring.

66. FOREIGN MATERIAL IN PAINT

In instances where minute particles of foreign material have embedded themselves in the horizontal surfaces of the paint, they are quite likely abrasives, such as metal particles, that have been carried through the air.

If these particles are allowed to remain on the paint surfaces for any length of time in the presence of moisture, a chemical reaction will take place, resulting in the metal particles eating into the paint surface. Early removal of this material by a thorough washing will prevent this from happening.

NOTE: When the above described condition is encountered in the field, it is often mistakenly diagnosed as rust coming up from the metal below the paint.

PART 5
CONVERTIBLE COUPE

67. WINDSHIELD

Removal

(1) Cover the adjacent cowl, hood and fender area with a protective covering.

(2) Release the top locking mechanism and push the top header from the windshield frame to expose the screws holding the mouldings.

(3) Remove the windshield wiper arms and blades.

(4) Remove the upper moulding attaching screws and remove the moulding.

(5) Remove the screws attaching the inner and outer side "A" post side mouldings.

(6) Remove the sun visors.

(7) Remove the screws attaching the header trim cap to the header (Fig. 63).

(8) Pry the header moulding up slightly to clear the moulding from the weatherstrip then disengage from the header and remove.

(9) Remove the windshield glass.

Installation

Install the windshield on the convertible in the same manner as described for other models, then continue as follows:

(1) Slide the header cap moulding up against the weatherstrip (Refer to Fig. 63).

(2) Force the moulding against the weatherstrip, then press the rear edge down over the header.

(3) Install the screws to hold in position, then rap slightly with a rubber hammer to seat (Be sure the cap is evenly spaced across the header).

(4) Install the screws and tighten securely.

(5) Install the side trim mouldings.

(6) Press tightly against the weatherstrip, engage with the header, and lower the mounting, then press down over the "A" post and install the retaining screws.

(7) Seal the windshield.

(8) Install the sun visor, wiper arm, check for water leaks and clean the windshield.

(9) Install the windshield wiper arms, then clean the windshield, using a suitable solvent. Test the windshield for water leaks.

(10) Operate the windshield wiper and adjust the arms if necessary.

68. CONVERTIBLE TOP

Care and Cleaning of Top

Frequent brushing and vacuuming will keep the top free of abrasive dust and dirt. Wash the top with warm water and mild soap, lathering well with soft cloth or sponge. Rinse with plenty of clean water to remove all traces of soap. Allow to dry completely before lowering.

CAUTION: Never lower the top when it is wet. The top cover should be placed in the top cover bag and stored in the luggage compartment. Never store the top cover in the top well compartment.

69. TO LOWER THE TOP

Release the safety catch on the end locking handle, pull the handles down and to the rear. Then push the header free of the windshield. Be sure the convertible top storage compartment is free of articles. The rear window need not be unzipped. Operate the engine in **NEUTRAL** at a speed above idle. Turn the top control switch located on the instrument panel to the right and hold in this position until the top is fully lowered.

WARNING: Never attempt to raise or lower the top while the vehicle is in motion. It is advisable to raise and lower the top at least once a month to keep the top mechanism in working condition.

70. TO RAISE THE TOP

Unsnap the top boot at the sides and rear and carefully fold into the storage compartment. Turn the top control switch to the left and hold in this position until the header rests on the windshield. Pull the top down firmly on the top header. Push the locking handles all the way forward until the safety catch engages.

71. TOP ADJUSTMENTS

Convertible top adjustments are of two general classifications — minor and major. The minor adjustments are easily accessible and can be made without any major disassembly.

Minor Adjustments

The minor adjustments are provided to assist in aligning the top header in relation to the windshield header to prevent water and air leakage into this area; to improve top frontal area appearance and assure ease of operation in raising and lowering the top. They are also provided to assure correct align-

ment of the roof side rails with door and quarter glass to prevent air and water leakage. Adjustments are also provided to eliminate wrinkles in the top material.

Major Adjustments

The only major adjustment is at the prop control link bracket at the rear quarter panel. It is used to improve roof side rail alignment if minor hinge adjustments do not completely correct the condition. Making this adjustment involves removing the rear seat and quarter pocket panels.

Door and Glass Alignment

It is important to remember that before making any top adjustments, doors, vent wings and door and quarter glass must be properly aligned. Misalignment in any of these areas would make it impossible to obtain satisfactory results from top adjustments alone.

Adjust Up-Stops

Up-stop adjustments should be made after the correct roof side rail alignment to limit the upward travel of the glass. This is necessary to assure effective sealing between the roof side rail weatherstrip and glass.

72. TOP HEADER SEAL

The entrance of water and air between the top header and windshield header is eliminated by a closed cell weatherstrip secured to the underside of the top header. The lip on the forward edge of the weatherstrip contacts the windshield header outside finish moulding.

Header Locating Dowels

Good weathersealing at the frontal area is dependent upon proper positioning of the top header on the windshield header. Two steel locating dowels, one assembled in each end of the top header, engage sockets in the windshield header to correctly position the top header. The sockets are slightly oversize to permit fore-or-aft or lateral top header movement for proper positioning.

The top header is adjustable at the front roof side rails to permit fore-or-aft and lateral movement. The header is attached to the side rails by two header-to-side rail screws on each side.

Top Header Latching Mechanisms

The amount of pressure exerted by the weatherstrip against the finish moulding is controlled by top latching mechanisms attached to the top header. The locking and unlocking effort of the latching mechanism is adjustable to control the pressure on the weatherstrip.

The latching mechanisms are adjusted for correct latching effort by unlatching the mechanisms and turning the locking hooks in or out as necessary (Fig. 64).

73. TOP HEADER ADJUSTMENT

Incorrect alignment between the top header and the windshield finish mouldings may result in air or water leakage. Inspect the clearance between the header and the finish moulding for uniformity. If the top header is too far forward at one end or all across the finish moulding, the interference between the header and the finish moulding may prevent proper pressure on the weatherstrip when the top header is latched. This condition will also cause objectionable high locking and unlocking effort. The misalignment may also result in making it difficult to engage the top header locating dowels in their sockets.

To eliminate the interference between the header and the finish moulding, loosen the two vertically positioned header-to-side-rail screws in the header, inboard of the header panel (Fig. 65). Adjust the header, as required, to provide the proper clearance.

Forward movement of the header will be limited by the amount of top material. Inspect the top header dowel engagement in the windshield before securing the screws. If there is interference between the dowels and sockets, adjust the header, as required. Tighten the screws securely.

CAUTION: When servicing the top linkage, keep a watchout for any sharp edges or burrs on the top linkage or mouldings that can damage the top

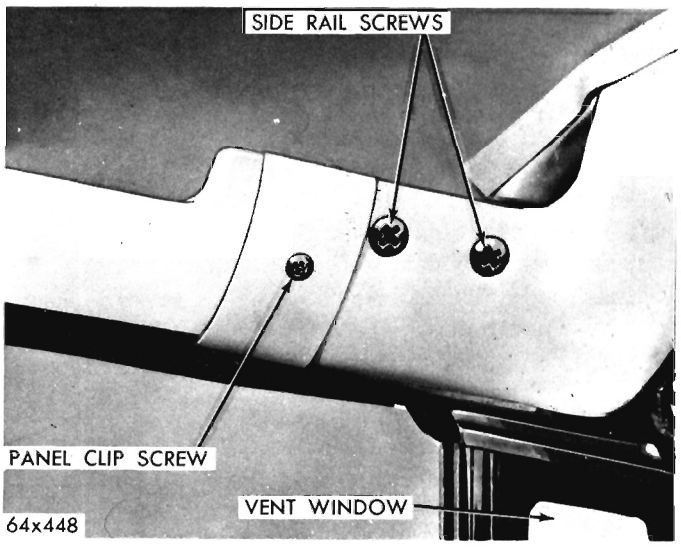


Fig. 65—Top Header Adjusting Points

material. Dress or file them down. Also, watch for screws that are too long and can damage the top material. Cut off the excess length, or replace with shorter screws.

74. CORRECTING TOP HEADER WATER LEAKS

If adjusting the top header for uniform spacing and the latching mechanisms for proper header tension on the header weatherstrip does not provide satisfactory sealing, additional sealing on the underside of the header will be necessary.

Remove Weatherstrip Retainer

Lower the top and fold it back into the top well. Remove the small curved black metal weatherstrip retainer and screws at each corner of the header and discard them. If the weatherstrip shows signs of distortion in this area due to the retainer, discard it. The weatherstrip cannot be reshaped to provide an effective seal.

Punch a three-sixteenths-inch hole at each corner of the weatherstrip, midway between the two corner retainer screw holes. Drill a number twenty-eight hole in the top material retainer, at each corner, in line with the punched hole in the weatherstrip.

Remove the weatherstrip retainer and the top material retainers from the top header and discard the screws. New, longer screws must be used when the retainers are reinstalled.

Header-To-Roof-Rail Joint Sealing

Seal the joints between the top header and the front roof side rails by applying one-inch balls of body sealer to the notches formed by the joint between side rail and the top header.

Cement a strip of polyethylene foam seal, Part No. 2484159, across the header, close to the corners, and extending out one-quarter inch from the header inner panel at the ends. Install the top material and weatherstrip retainers, using round washer head screws, No. 8-18 x ½".

Sealing Ends of Top Material Retainers

It is important to seal at **both ends** of the two curved top material retainers. Use a one-half inch ball of body sealer under the offset tab at the end of the curved retainer. Apply a four-inch length of sealer to the joint formed by the curved retainer and the header weatherstrip retainer.

Cementing Weatherstrip to Retainer

Apply a light coating of rubber cement on the inside of the weatherstrip retainer and the weatherstrip. Allow cement to become tacky on retainer and weatherstrip before installing weatherstrip. Cementing the weatherstrip in place will hold it securely and enable the lip to provide a good seal at the windshield finish moulding.

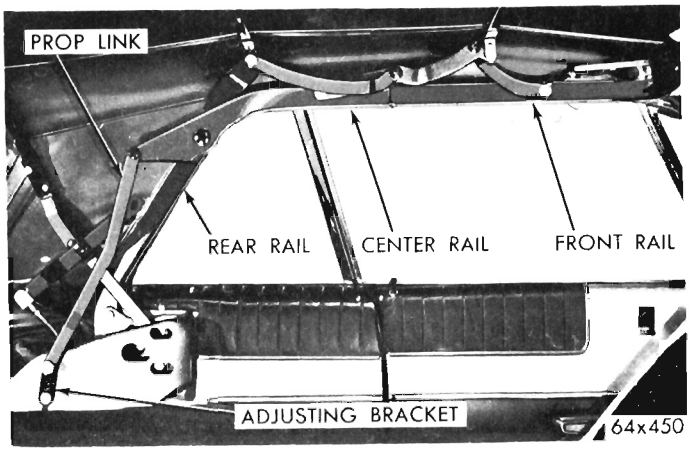


Fig. 66—Roof Side Rail Structure

Secure the weatherstrip at the corners with No. 8-18 x ½" round washer head screws and plain washers, 3/16" I/D x 5/8" x 1/32", using the three-sixteenths-inch holes punched in the weatherstrip.

Raise the top and carefully water test the area on the work performed.

75. ROOF SIDE RAIL ALIGNMENT

The roof side rail structure (Fig. 66) consists of three separate rails, hinged together to enable the top to fold into the well when not in use. Hinges are provided between the front and center rails and the center and rear rails. The rails must be in good alignment and parallel to the top edges of the vent wings, door and quarter glass to provide a good weatherseal. Alignment of the rails is controlled by a set screw arrangment which consists of a socket-type set screw in one rail and a steel drive stud in the adjoining rail.

Side Rail Hinge Locations

The front hinge set screw is accessible from the top surface of the front rail and angles downward to the rear. It contacts the steel drive stud in the center rail to open or close the hinge, as required. The rear hinge set screw is located in the underside of the center rail and angles upward and to the rear. It contacts the drive stud in the rear rail. Access to the set screw can be made by removing the center roof side rail weatherstrip and retainer.

Front Hinge Misadjusted

Water and/or air leaks between the top and door or quarter glass may be caused by poor contact between the roof side rail weatherstrip and the glass or only a partial contact between the roof rails and

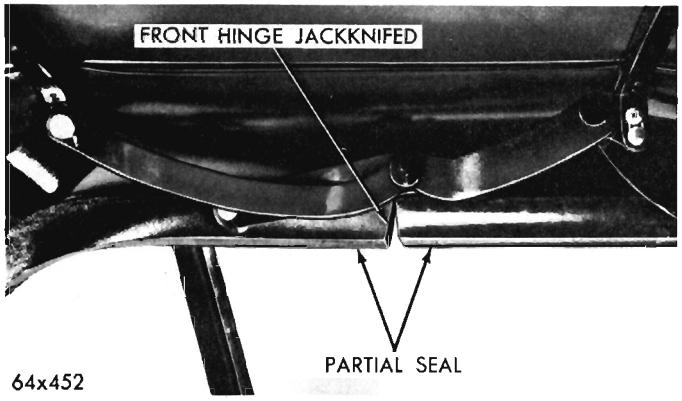


Fig. 67—Front Hinge Jack Knifed

the top edge of the glass. If inspection shows the leakage is due to a jack knifed condition (Fig. 67) at the hinge, it will be necessary to adjust the hinge set screw to close the joint.

CAUTION: To avoid stripping the set screw threads, unfasten the top header latches to relieve tension on the top linkage, before adjusting the set screws.

76. ADJUSTING FRONT HINGE

If the front hinge is jackknifed, use a one-eighth-inch Allen wrench and turn the set screw (Fig. 68) in a counter-clockwise direction to close the joint until the front and center rails are parallel. Fasten the top temporarily to inspect parallelism and alignment with the door glass. Readjust the set screw, if necessary.

77. REAR HINGE ADJUSTMENT

Inspect the center and rear roof side rail alignment

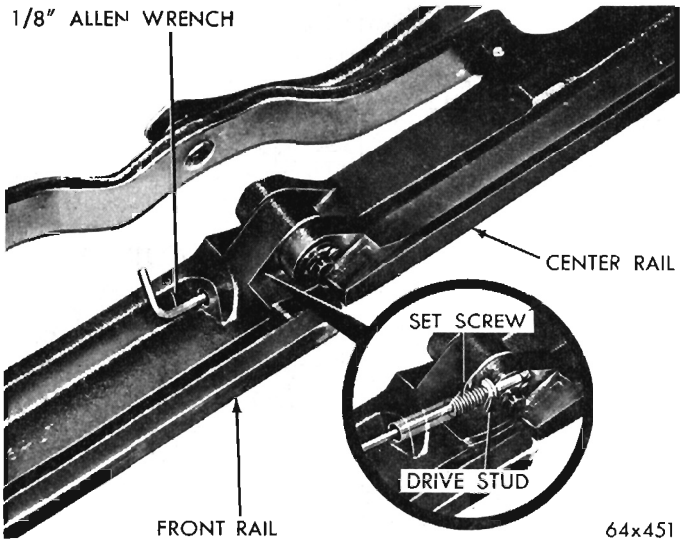


Fig. 68—Front Hinge Adjusting Screw

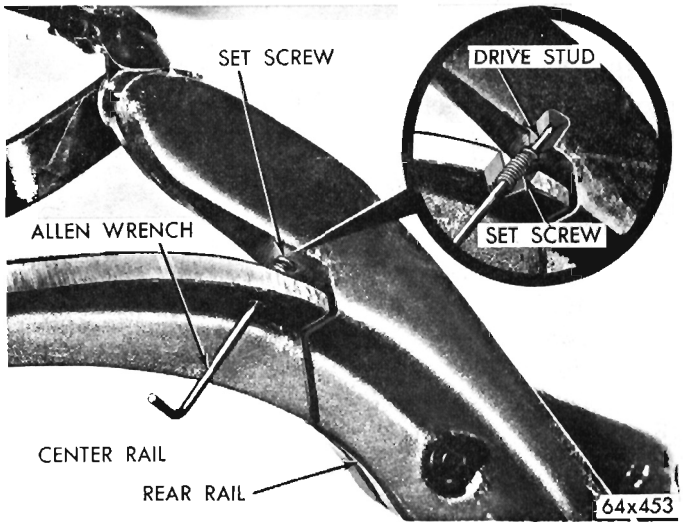


Fig. 69—Rear Hinge Adjusting Screw

at the quarter glass. If additional clearance is noted in this area, as indicated by the hinge being jack knifed open, again unfasten the top header. Remove the side rail weatherstrip and retainer and adjust the rear hinge set screw (Fig. 69) from the underside of the center rail until proper alignment and clearance is obtained.

Adjusting the two hinge set screws will normally correct any roof side rail alignment problems, however, if an alignment problem still exists, and additional leveling of the roof side rails is required, the linkage through the main control prop link bracket can be adjusted.

78. MAIN CONTROL PROP LINK BRACKET ADJUSTMENT

To gain access to this bracket, remove the rear

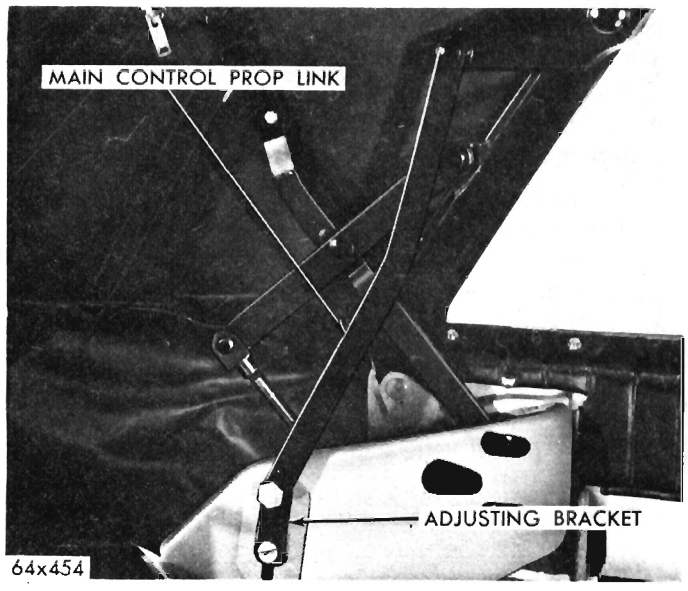


Fig. 70—Main Control Prop Link Bracket Adjustment

seat and the pocket panels on both sides. Unfasten the top header latches to relieve the tension from the linkage. The door glass and quarter glass must be raised to prevent the side rail structure from dropping when the adjusting bracket screws are loosened.

The serrated prop link adjusting bracket is attached to the quarter panel reinforcement by two screws threaded into a tappet plate (Fig. 70). Loosen the screws just enough to permit moving the bracket up or down, as required. Raising the bracket and link causes the center rail to rotate on its pivot in the rear rail, lowering the front and center rails to improve the weatherstrip fit with the door and quarter glass. When proper alignment has been obtained, tighten the adjusting bracket screws. Inspect the side rail hinge adjustments, and adjust as necessary.

79. TOP SHIFTS TO ONE SIDE

If it is necessary to pull the top to one side to engage the locating dowels in their jackets in the windshield header or the top shifts to one side when raising the header from the windshield header, inspect the main prop link bracket adjustments. Brackets not adjusted uniformly, changes the operating angle of the linkage causing the top to twist when it is raised.

When one bracket is adjusted, be sure that the position of the bracket on the opposite side is inspected and adjusted, if necessary.

80. POWER GUIDE LINK ADJUSTMENT

(Plymouth Only)

NOTE: It should not be necessary to adjust the power guide link supports unless the top assembly has been removed for servicing or replacement of linkage parts. When this is done, be sure both supparts are adjusted to provide identical travel of the piston rods.

The link adjusting support is attached to the panel by two screws, which when loosened, permit forward or rearward movement of the support. It is important that the supports on both sides be positioned at approximately the same position. If one support is positioned rearward of the other one, it would cause the power piston rod linked to that support to start to actuate the linkage slightly ahead of the piston rod on the opposite side. This can cause one side of the top to twist slightly.

The rearward position of the support also increases the travel of the power piston rod, resulting in a small amount of overtravel when the top is fully raised. When the power is turned off, the power piston assumes its normal position due to leak-back in the hydraulic system.

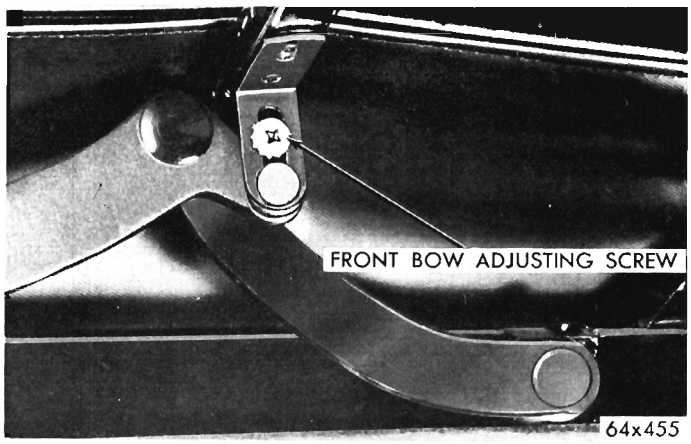


Fig. 71—Front Top Bow Adjustment

81. FRONT TOP BOW ADJUSTMENT

(Plymouth Only)

If the top material at the front bow appears to hang down too low and interfere with the top edge of the door glass when the door is closed, adjust the number one top bow at the adjusting plate attached to the outer ends of the top bow (Fig. 71). This permits the bow to be moved up or down, as required.

If the roof side rails are exposed below the top material, the bow can be lowered. To adjust the bow, loosen the screw at each end and move the bow up or down, as required.

82. TOP MATERIAL PADDING FOR OVERHANG

On Valiant models, excessive top material overhang can be corrected by installing temporary padding between the stay padding and top material. These temporary pads can be removed later when they are no longer required. When making this adjustment, inspect the upper end of the door glass moulding for sharp edges that can cut the top material. Dress down or file off any sharp edges.

83. ROOF SIDE RAIL WEATHERSTRIP ADJUSTMENT

After the roof side rails have been aligned, inspect the side rail weatherstrip to make sure it is providing a good seal at the top of the door and quarter glass.

If the weatherstrip is not sealing properly, the retainer and weatherstrip can be adjusted to improve the seal. The retainer has elongated attaching screw holes which permit the retainer and weatherstrip to be moved in or out.

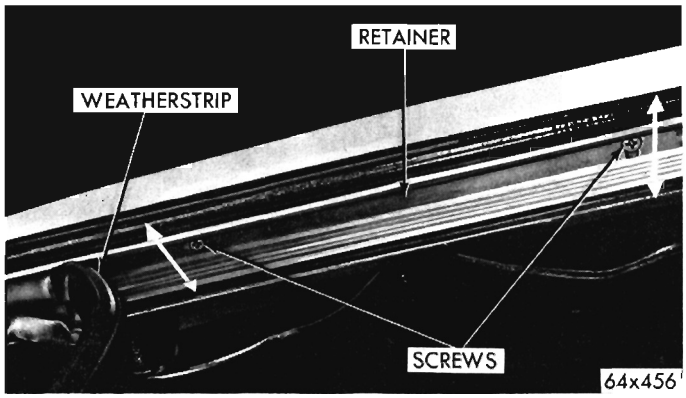


Fig. 72—Roof Side Rail Weatherstrip Adjustment

To adjust the seal fit along the edge of the glass, loosen the retainer screws under the weatherstrip and adjust the retainer, as required (Fig. 72).

Raise the glass until the top edge of the glass curls the outer lip of the weatherstrip inward just enough to contact the inner lip. Adjust the up-stops to limit further upward travel of the glass.

84. REAR BOW TENSION CABLES

Two steel cables attached to the rear bow and the top well are provided to keep the bow from moving forward and wrinkling the top material. They also prevent excessive tension on the backlight zipper. The upper end of the cables are attached to the bow by screws. The lower end is threaded into a clinch nut attached to a bracket at the top well which permits the cables to be shortened or lengthened to increase or decrease tension (Fig. 73). The degree of tension is determined from a measurement taken between the lower rear edge of the bow and the ledge of the top well under the backlight.

NOTE: Before attempting to adjust the cables, unfasten the top header latches to relieve tension on the linkage.

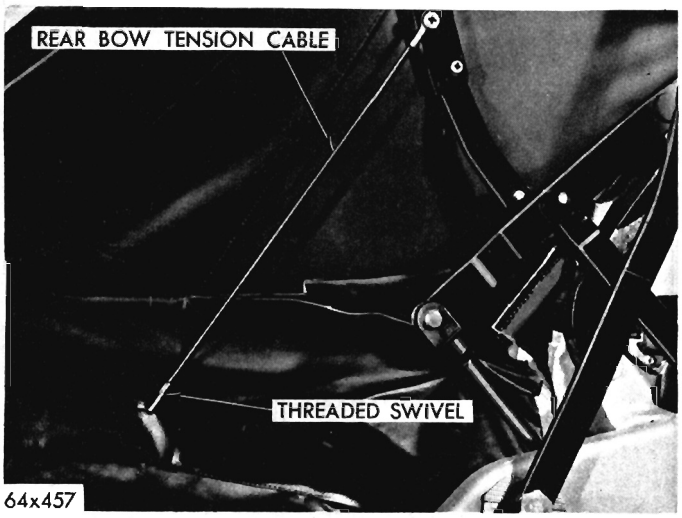


Fig. 73—Rear Bow Tension Cable Adjustment

Testing Cable Adjustment

On the inside of the car, locate the centerline of the top on the rear bow and the ledge of the top well. From the centerline, measure 20 inches (Plymouth), 17½ inches (Valiant) each side of the centerline at the bow and the ledge. These are locating points for backlight depth dimensions that govern the cable tension.

Measure down from the rear edge of the rear bow to the top well ledge on each side.

If the spacings between the bow and the ledge are not 25½ inches (Plymouth), 24$^{5}/_{16}$ inches (Valiant), the cables must be adjusted. With an assistant holding a tape measure at one location, remove one cable attaching screw. While holding the top bow in the measured position, turn the upper end of the cable in the proper direction until the eye of the cable is in line with the screw hole. Install the screw. Repeat the procedure, if required, on the opposite cable.

85. REMOVING WRINKLES IN BACKLIGHT

Cable adjustment may cause wrinkles in the backlight area. To correct this condition, it will be necessary to remove the mouldings and retainers and relocate the backlight and quarter trim.

Before removing the moulding screws, place a strip of masking tape on the deck, directly behind the mouldings. Mark the screw locations on the tape to aid in reassembly.

Remove the moulding screws, moulding, retainer screws and retainer. Restretch the backlight and quarter trim to remove the wrinkles. Trim off excess backlight and quarter trim material that extends beyond the retainer. Reinstall the retainers and mouldins.

86. CORRECTING TOP WELL WATER LEAK

Water leaking into the top well may be entering between the lower edge of the backlight and the deck opening upper panel. To correct, seal the area with body sealer and a polyethylene foam seal. Apply a strip of masking tape on the deck panel directly to the rear of the finish moulding to facilitate the installation of the retainer and moulding screws.

Remove the moulding and retainer screws. Lift off the mouldings, retainers and top material from the deck panel. Carefully clean the deck panel surface. Spread a bead of body sealer along the edge of the panel. Place the top well material back in position on the sealer. Position a 104-inch x ⅝-inch wide x ⅛-inch polyethylene foam seal on the top material.

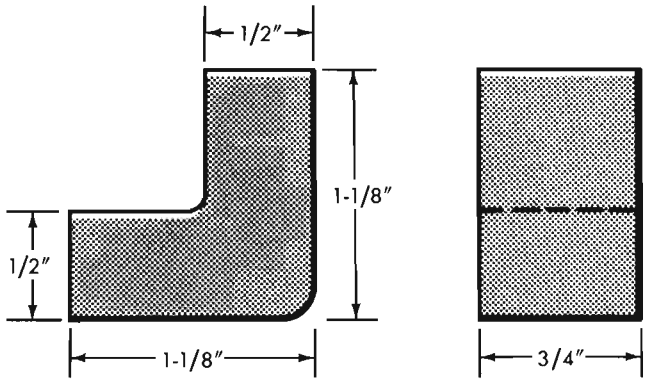


Fig. 74—Quarter Window Belt Water Seal Dimensions

Install the retainers. Install an additional No. 8, self-tapping screw with a plain washer through the top material and deck panel, midway between the center and end retainers to provide a tight seal. Install the mouldings. Water test the area and inspect for leaks.

87. QUARTER WINDOW BELT WATER LEAK

This condition can be corrected by cementing a rubber baffle on the lower end of the rear side rail.

From the inside, slit the top fabric flap to the bottom edge of the rear roof side rail and then fold the lower flap outward to provide enough room to install the seal.



Fig. 75—Quarter Window Belt Water Seal Installed

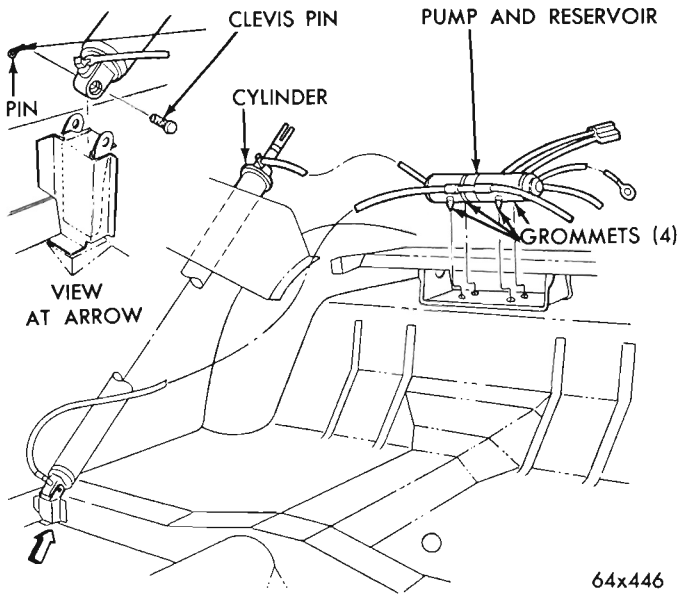


Fig. 76—Hydraulic Folding Top Mechanism (Plymouth Shown)

Cut a seal from a piece of closed-cell rubber according to the dimensions shown in Figure 74. Coat the inside and top surface of the seal with rubber cement. Apply a coating of rubber cement to the lower, rear inside surface of the side rail weatherstrip and the lower end of the side rail. When the cement has dried tacky, press the seal firmly in place (Fig. 75) on the side rail. Repeat the operation on the opposite side.

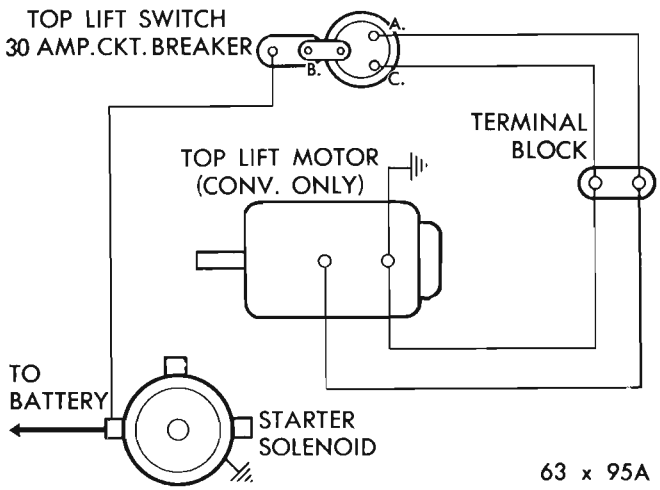


Fig. 77—Hydraulic Top Wiring Diagram

88. SERVICING THE TOP FOLDING MECHANISM

The electric-hydraulic top folding mechanism (Fig. 76) consists of two cylinders, a piping system, an electric motor, a pump and reservoir assembly, and a double-throw rotary switch. The wiring and motor

are protected by a separate circuit breaker as shown in Figure 77.

The pump is a two-direction, reversing motor type and is connected to the cylinders by flexible lines and tubing. A valve and port assembly in the reservoir directs flow of fluid in the system. The motor pump, and reservoir assembly can be replaced as a unit, or electric motor can be replaced separately. The cylinders are sealed units and must be replaced as assemblies. If difficulty is encountered in raising or lowering the top with the motor running, with sufficient fluid in the reservoir, and with the pivot points operating freely without binding, the cause is probably improper linkage alignment and adjustment.

89. CHECKING FLUID LEVEL IN RESERVOIR

Insufficient fluid in the system may cause the top to raise slowly or cause noise in the pump and motor during operation. If low, inspect for a leak due to a broken line or loose connections. Replace the line or tighten the connection as necessary. Fill the reservoir until fluid runs out of the filler hole. Use type "A" suffix "A" automatic transmission fluid.

NOTE: After filling reservoir, raise and lower the top several times to force out air that may be trapped in the system. Always check fluid level when the top is lowered.

90. TOP WILL NOT RAISE OR LOWER

Hook one wire of a test lamp to a good ground and the other wire of the test lamp to the feed terminal on the control switch. The test lamp should light. If the test lamp does not light, tighten all electrical connections, test on each side of the circuit breaker, and replace the faulty wire or circuit breaker, and repair or replace the wire.

91. TESTING THE ELECTRICAL CIRCUITS

Testing the Top Control Switch

Disconnect the black wire at the top convertible control switch and hold it firmly against the black and red wire terminal on the control switch. The top (if raised) should start to lower. Repeat this test with the green wire. The top (in lowered position) should start to raise. If the top operates during these tests, but fails to operate when the control switch lever is moved to the right or left, the switch is at fault and should be replaced. If the top fails to operate during these tests, follow the procedure outlined for Adjusting the Top, Checking Fluid Level in Reservoir and Testing Wires Between the Control Switch and the Pump Motor.

92. TESTING WIRES BETWEEN CONTROL SWITCH AND PUMP MOTOR

This test can be made from the luggage compartment. Test the pump motor ground wire (black wire between the pump motor and ground) to make certain it has a good, clean ground connection. Hook one wire of the test lamp to the black wire terminal on the pump motor and ground the other wire of the test lamp. Move the top control lever to the right. The test lamp should light. If the test lamp does not light, the black wire between the pump motor and the control switch is faulty and should be replaced. Repeat this test at the green wire terminal, moving the top control lever to the left. If the test lamp lights in both cases but the pump motor fails to operate, repair or replace the pump motor as necessary.

93. REAR WINDOW

The rear window is made from flexible vinyl plastic material and special attention should be given to cleaning and storage of the window. To clean the window, rinse with cold water spray to remove grit and dirt. Lather the surface with suds of mild soap, using the palm of hand. Rinse thoroughly and allow to air dry. Do not use towel, sponge, or chamois to apply suds or to dry the window. Otherwise, the surface may become scratched. If this procedure does not clean the window thoroughly, a solution of 40 per cent rubbing alcohol and 60 per cent clean water should be used. Apply with palm of the hand and rub the surface of the window with a circular motion. Use the solution generously.

PART 6

STATION WAGON

94. TAIL GATE (Plymouth and Valiant)

The tail gate of the Station Wagon Model is hinged at the lower corners and is counterbalanced by one torsion bar to aid in raising and lowering. The 3 seat Station Wagon is equipped with an electric window which is optional on the other models. The electric window is controlled by a switch on the instrument panel. An externally operated lock cylinder switch provides for external operation of the window.

A pull type handle is located in the center of the upper inside garnish moulding to unlatch the tail gate. The tail gate is held closed by two rotary type locks mounted on the sides of the tail gate. These rotary locks engage two-stage strikers attached to the pillar posts.

95. TAIL GATE ALIGNMENT (Plymouth and Valiant)

Tail gate alignment is essential to insure ease of window operation and weather sealing.

Prior to changing the alignment of the tail gate, scribe an aligning mark around the tail gate hinge plate, tail gate leveling guide and the tail gate latch. Repeat this on both pillar posts. This provides marks to show the amount of movement. Vertical adjustment and "**in**" and "**out**" adjustments (Fig. 78), are made in at the hinge plate. "**In**" and "**out**" alignment of the top of the tail gate is adjusted by moving the latch "**in**" or "**out**" to permit ease of entry of the tail gate glass into the upper run channel. Leveling of the tail gate in the "**open**" position is made by raising or lowering the tail gate leveling guide. Lateral adjustment to center the tail gate in the body opening is controlled by the tail gate attaching screws under the base of the tail gate.

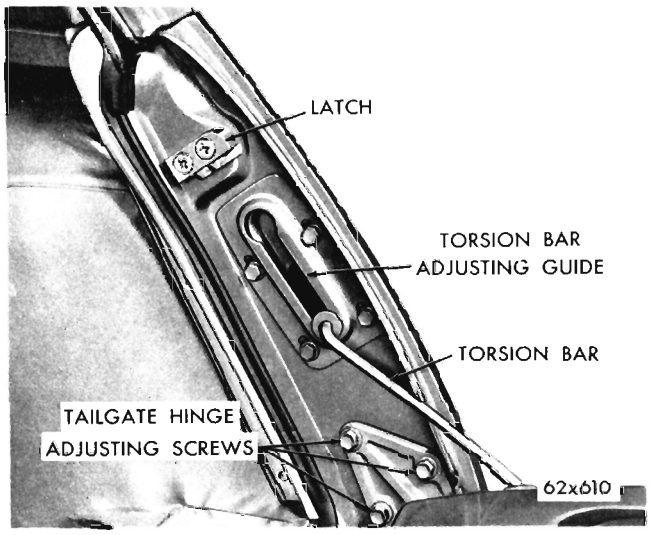


Fig. 78—Tailgate Alignment Points

96. TAIL GATE (Plymouth)

Removal

(1) Remove the rear bumper face bar to enable the tail gate to be removed down and out of the body opening.

(2) Under the tail gate door, remove the torsion bar brackets from the pillar post.

(3) Open the tail gate and support it on jacks or stands.

(4) Loosen the hinge pivot pin locking screws (Fig. 79).

(5) Use a pencil and outline the hinge plate position on the pillar post for future assembly.

NOTE: On vehicles with electric windows, disconnect the battery negative terminal at the battery, remove the trim panel and disconnect the terminals at the control switch on the left edge of the tail gate.

(6) Remove the hinge plate attaching bolts from the pillar post (Fig. 78).

(7) Slide the hinge plate and torsion bar in through the guide toward center of the tail gate.

(8) Lower the tail gate down and out of the body opening.

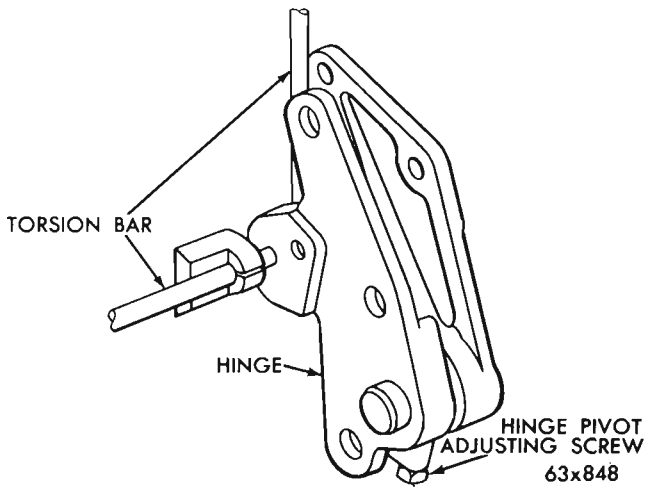


Fig. 79—Hinge Pivot Anchor Screw

Installation

(1) With the torsion bars and hinge plates pushed in toward the center of the tail gate, engage the hinge plates into the lower opening of the body.

(2) Attach the hinge plate attaching bolts into the pillar posts and locate the hinge plates in relation to the previous pencil marked positions.

(3) Tighten the attaching bolts firmly enough to hold the position and inspect the alignment.

(4) Close the tail gate and center in the opening.

(5) Attach the torsion bar bracket to the pillar post.

(6) Open the tail gate and tighten the locking screws on the hinge pivot pin (Fig. 79).

(7) Connect the wires to the control switch and install the trim panel.

(8) Operate the tail gate window and inspect the alignment.

97. TAIL GATE (Valiant)

Removal

(1) On the electric operated tail gate window, remove the inside trim panel and disconnect the wiring.

(2) Place padded jacks or stands under the fully opened door.

(3) Scribe the location of the torsion bar support and guide.

(4) Using the torsion bar holding Tool C-3449 remove the tail gate support and guide attaching bolts from the right pillar post.

(5) Remove the left tail gate support arm from the left pillar post.

(6) Remove both hinge attaching bolts from the pillar posts.

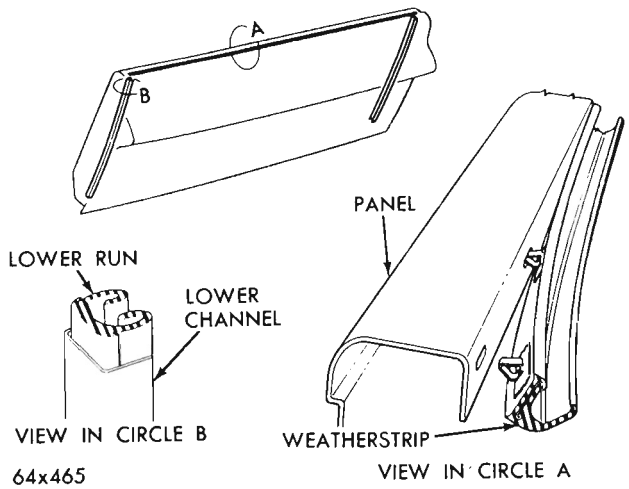


Fig. 80—Tail Gate Run Channel Attaching Points

(7) Remove the tail gate from the body.

Installation

(1) Place the tail gate on padded jacks or stands.

(2) Align the hinge with scribe marks and install the attaching bolts finger tight.

(3) Attach the left tail gate support arm.

(4) Using the torsion bar holding Tool C-3449, align the torsion bar support and guide bracket with the scribe marks, install and tighten the attaching bolts.

(5) Inspect the tail gate hinge alignment and tighten the attaching bolts.

98. TAIL GATE GLASS (Plymouth and Valiant)

Removal

(1) Lower the tail gate glass and open the tail gate.

(2) Remove the attaching screws and remove the garnish moulding and handle.

(3) Remove the inside trim panel.

(4) With an assistant holding the instrument panel switch in the "**up**" position, operate the control switch on the left side of the tail gate and support the glass as it emerges.

(5) Remove the regulator arms from the window frame and remove the glass from the tail gate.

Installation

(1) Insert the glass into the tail gate run channels deep enough to engage the regulator arms into the window frame.

(2) Install the inside trim panel.

(3) Install the garnish moulding and handle.

(4) Operate the window and inspect for misalignment.

99. TAIL GATE RUN CHANNEL (Pymouth and Valiant)

Removal and Installation

(1) With the tail gate glass removed, remove the channel attaching and adjusting bolts (Fig. 80).

(2) Install the run channels and attach with the adjusting bolts. Tighten only finger tight.

(3) Run the glass to the bottom stop and close the tail gate.

(4) Operate the glass up and down several times to center the run channel.

(5) If the glass binds in the run channel loosen the regulator attaching bolts.

(6) Tighten the regulator and run channel bolts.

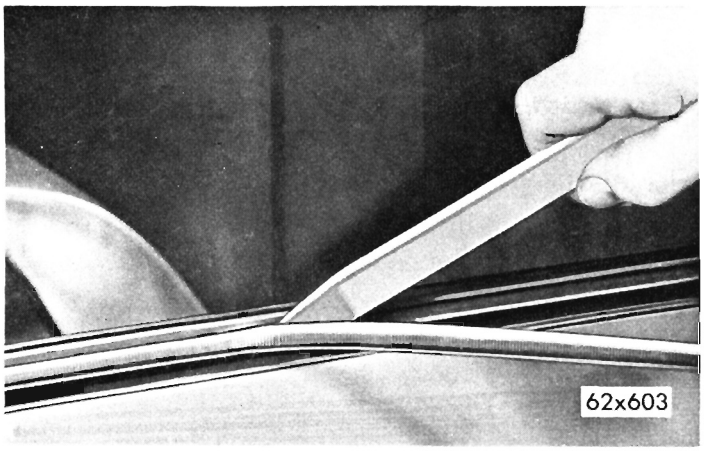


Fig. 81—Removing Mylar Strip from Weatherstrip

100. QUARTER WINDOW (Plymouth and Valiant)

Removal

(1) Using a wedge shaped fibre tool, remove the mylar locking strip from the quarter window weatherstrip (Fig. 81).

(2) Unlock the weatherstrip from the quarter window using a fibre wedge (Fig. 82).

(3) With an assistants help, remove the quarter window from the weatherstrip.

Installation

(1) Position the quarter window on the weatherstrip and using a fibre wedge install the quarter glass into the weatherstrip.

(2) Install the mylar locking strip using Tool C-3840 (Fig. 83). Start the installation at the bottom of the weatherstrip.

(3) Clean the quarter window with a suitable solvent and test for water leaks.

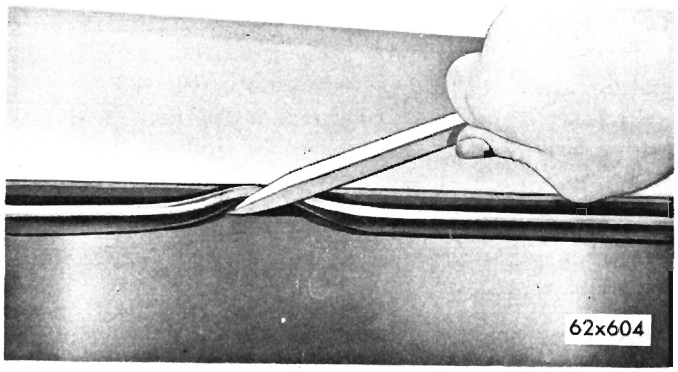


Fig. 82—Unlocking Weatherstrip from Quarter Window

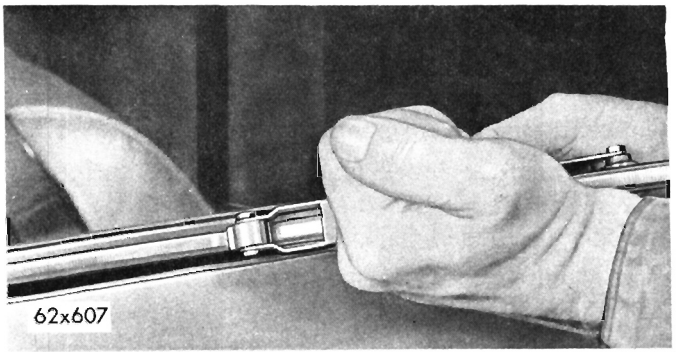


Fig. 83—Installing Mylar Strip

101. TAIL GATE GLASS ALIGNMENT (Plymouth and Valiant)

(1) Remove the inner trim panel from the tail gate door.

(2) Loosen the four window regulator attaching screws.

(3) Close the tail gate door and run the tail gate glass up to within ½ inch of the closed position.

(4) From inside the vehicle position the window regulator assembly so that the top edge of the glass is parallel with the top of the window opening in the tail gate door.

(5) Tighten the four window regulator attaching screws and test the operation of the window.

(6) Install the inner trim panel on the tail gate door.

102. STATION WAGON REAR SEATS

Removal (Second Seat Back)

(1) Remove the screws attaching the second seat back to the hinge assemblies (Fig. 84).

(2) Release the spring type retainer catches from the seat back and remove the seat back assembly.

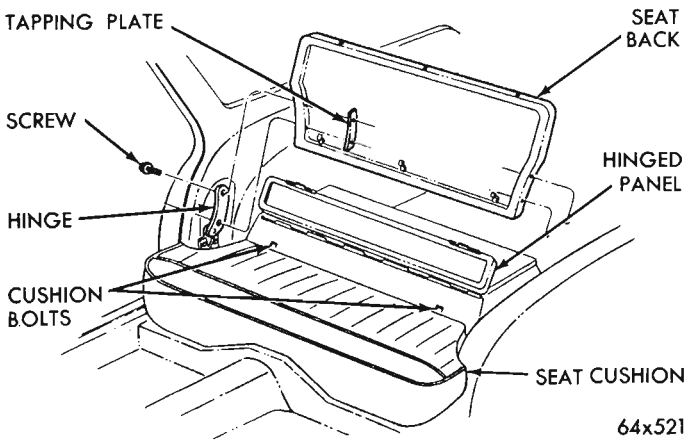


Fig. 84—Station Wagon Second Seat Installation

Installation (Second Seat Back)

(1) Position the second seat back on the hinge assemblies.

(2) Install the hinge to seat back screws and tighten to 80-120 inch pounds torque.

(3) Test the engagement of the seat back catches on the seat back and adjust as necessary. Adjustment of the catches is possible only in the IN and OUT directions.

Removal (Second Seat Cushion)

(1) Raise the rear floor hinged panel at the rear of the seat cushion assembly (Fig. 84) to expose the seat cushion to floor pan attaching bolts.

(2) Remove the bolts attaching the seat cushion to the floor pan.

(3) Move the seat cushion slightly rearward to disengage the locking bars at the front bottom side of the seat cushion, from the floor brackets.

(4) Remove the seat cushion assembly.

Installation (Second Seat Cushion)

(1) Place the seat cushion in position, making certain the locking bars at the bottom of the front seat cushion are engaged in the brackets on the floor pan.

(2) Raise the hinged portion of the rear floor, at the rear of the seat cushion, and install the bolts attaching the seat cushion mounting straps to the floor pan.

Removal (Third Seat Back) (Fig. 85)

(1) With the third seat back in the UP position, remove the retainers from the seat hinge support studs.

(2) Remove the seat back and support panel assembly.

(3) Remove the retainer from the seat back support hinge pin (Fig. 86) and remove the seat back assembly.

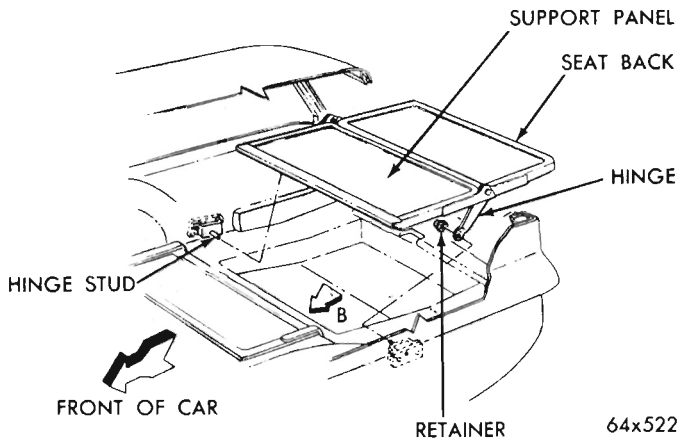


Fig. 85—Third Seat Back Assembly

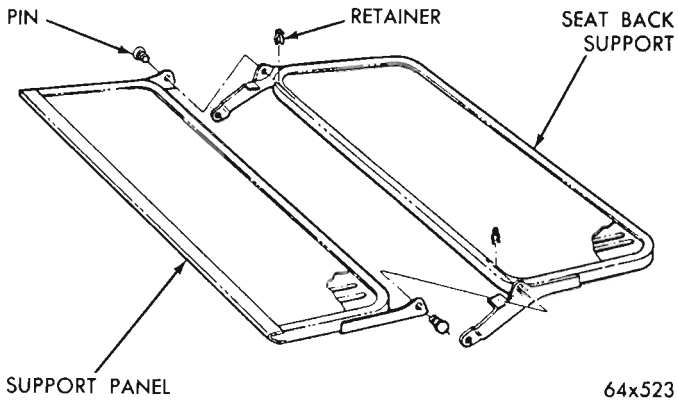


Fig. 86—Seat Back Attachment

(4) The seat back cushion is retained to the seat back panel (Fig. 87) with screws.

Installation (Third Seat Back)

(1) Position the seat back hinge on the support panel hinge and install the retainer pins and retainers.

(2) Position the seat back and support panel assembly on the studs (Fig. 85).

(3) Install the retainers on the stud.

Removal (Third Seat Cushion)

(1) The third seat cushion is attached to hinges which in turn are attached to the quarter inner panels by screws.

(2) Remove the screws attaching the hinges to the quarter inner panel.

(3) Remove the rear seat cushion assembly.

Installation (Third Seat Cushion)

(1) Position the cushion assembly on the rear floor pan.

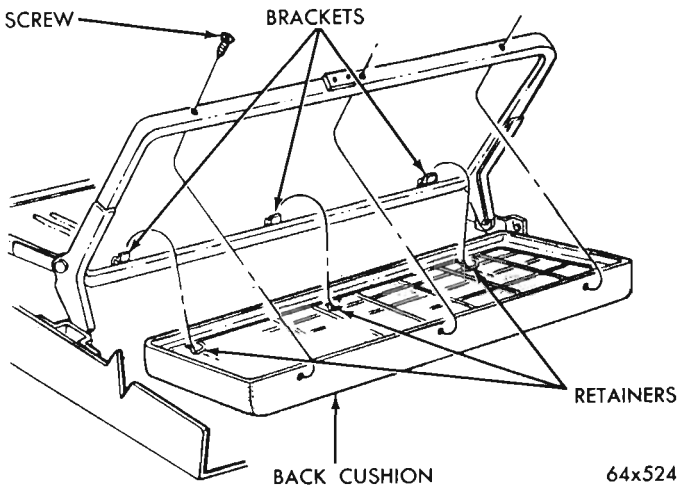


Fig. 87—Seat Back Cushion Attachment

(2) Install the hinges on the quarter inner panel and tighten securely.

(3) Test the operation of the seat and inspect the fit and alignment.

(4) Adjust as necessary by loosening the hinges and moving the seat as required.

SERVICE DIAGNOSIS

CONVERTIBLE COUPE TOP

Condition	Possible Cause	Correction
Folding Top Header and Windshield Header not Meeting at Correct Angle	(a) Incorrect front and rear side rail adjustment.	(a) With the top in the up position and the header locked in, turn the square head screw at the front side rail hinge and the set screw at the rear side rail hinge until they contact the head.
"Jack Knifing" of the Side Rails at the Rail Hinges.	(a) Improper alignment of the side rails to the top of the window glass.	(a) Adjust by moving the serrated adjustment plate up or down to hold the side rails in their correct relationship to the window frame. Adjust both sides to the same height to maintain parallelism of the side rails.
Improper Meeting (fore and aft) of the Folding Top Header with the Windshield Header.	(a) Improper adjustment of the power link.	(a) Adjust the power link "fore and aft" across the serrated plate. Adjustment is in direction of movement desired.
Folding Top Header Not in Alignment with the Guide Dowels on the Windshield Header.	(a) Improper adjustment of the folding top header.	(a) Adjust the folding top header "fore and aft" until alignment with the guide dowels is accomplished.
Top Fabric Too Loose or Too Tight.	(a) Improper adjustment of the Number 1 roof bow.	(a) Adjust the roof bow up or down on the bow support.
Air or Water Leaks at the Windshield Header.	(a) Folding top header torsion bar not properly adjusted.	(a) Adjust the folding top header torsion bar to accomplish a 30 pound locking handle effort.

GROUP 24

AIR CONDITIONING

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SPECIFICATIONS

COMPRESSOR

Location	Left of Center on Cylinder Block
Type	2 Cylinder "V" Type
Bore	2 5/16 inch
Stroke	1 1/8 inch
Displacement	9.45 cubic inch
Type Valve	Reed Type
Speed (depends on axle ratio and tire size)	Approximately 1250 rpm at 25 mph
Oil Capacity (Refrigerant Oil)	11 ounces
Clutch	Stationary Coil
Mufflers	In Compressor Discharge Line In Compressor and Suction Line

SPECIFICATIONS—(Continued)

CONDENSER

Location	Front of Radiator

RECEIVER—DRIER—STRAINER

Type	Cylindrical Steel Container
Location	In Front of Radiator Plymouth In Engine Compartment Valiant

REFRIGERANT

Refrigerant	Refrigerant 12
Total Charge	
Plymouth	45 ounces
Valiant	36 ounces

TORQUE REFERENCE

	Foot-Pounds	Inch-Pounds
Compressor Bearing Housing Bolt	10-13	
Compressor to Bracket Bolt	50	
Compressor Connecting Red Screw		52-56
Compressor Cylinder Head Cover Bolt	23-27	
Compressor Cylinder Head Cover (Nameplate) Bolt	20-24	
Compressor Discharge Adapter Bolt	14-18	
Compressor to Engine Bolt	30	
Compressor Oil Pump Cover Bolt	10-13	
Compressor Oil Sump	15-19	
Compressor to Strut Bolt	30	
Compressor Suction Adapter Bolt	10-14	
Magnetic Clutch to Compressor Bolt	20	

"O" RING NUT TORQUES

Line Size	Foot-Pounds	Line Size	Foot-Pounds
¼ SAE	12-14	½ SAE	30-35
⅜ SAE	20-25	⅝ SAE	55-65

AIR CONDITIONING

There are two types of Air-Conditioning units available on the Plymouth and Valiant Models.

A combination Air-Conditioning and heating unit is available on Plymouth Models which is dash mounted and operated by controls conveniently located on the instrument panel.

On Valiant Models, a separate Air-Conditioning unit is used from the heater. The Air Conditioning unit is mounted on the bottom of the instrument panel, centrally located and has no additional air ducts and the controls are integral with the unit.

1. AIR CONDITIONING—OPERATION (Plymouth Models)

A simple and versatile control system provides the driver with a wide choice of comfort conditions. Four push-buttons marked "Off", "Heat", "Defrost", "Cool" (Fig. 1) control vacuum actuators which position the outlet dampers for correct air distribution. The temperature control lever adjusts the setting of a pair of thermostatic valves, which maintains the temperature of the vehicle at a comfortable level in heat, defrost, and cool. Rotary blower switch has four positions as indicated by the white index marks (Fig. 2). These provide:

(1) Low speed-fresh air heating, defrosting, or fresh air conditioning.

(2) Medium speed-fresh air heating, defrosting, or fresh air conditioning.

(3) Medium speed-recirculating air conditioning.

(4) High speed-recirculating air conditioning.

NOTE: The heater and defroster are not intended to be operated with the "Blower" switch in either the No. 3 or No. 4 positions; therefore, the blower will not operate for these settings.

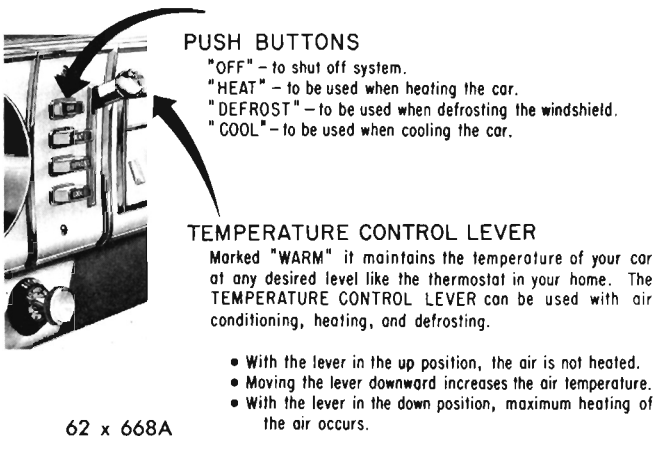


Fig. 1—Push Button and Temperature Control Lever (Typical)

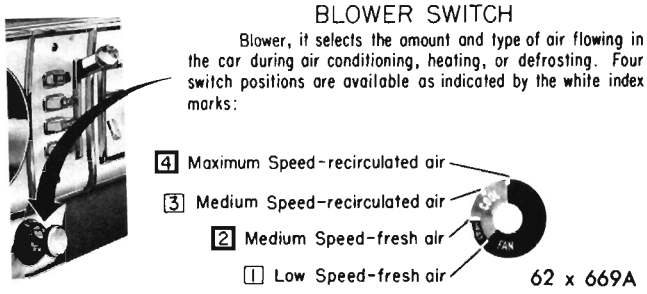


Fig. 2—Blower Switch (Typical)

Directional air conditioning outlets on the instrument panel also serve for defrosting. Two spot coolers also are provided; one at the left lower edge of the instrument panel, the other at the right kick panel area (Fig. 3). Additional outlets under the instrument panel direct cooling air down to floor level.

Air Flow For Each Push Button Position

When testing or adjusting the doors in the distribution system, it is necessary to know the correct position of each door for each push-button position. It is also necessary to know which vacuum hoses are activated for each push-button position. In the illustrations (Figs. 4 thru 9) which follow; air flow is indicated, also which vacuum actuator hoses are activated for each push-button position.

Ventilation

Pushing either the "Heat" or "Defrost", with blower switch on positions 1 or 2 and moving temperature control lever to off position, will set the system for fresh-air ventilation—a desirable setting when temperature conditions are such that neither cooling nor

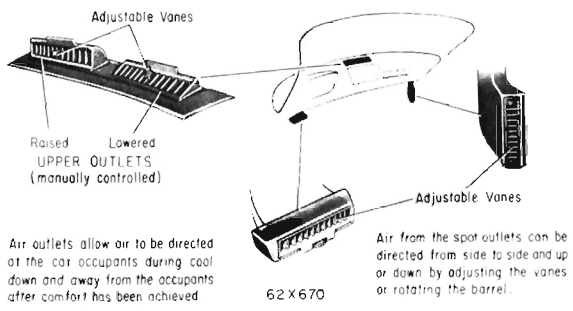


Fig. 3—Directional Outlets

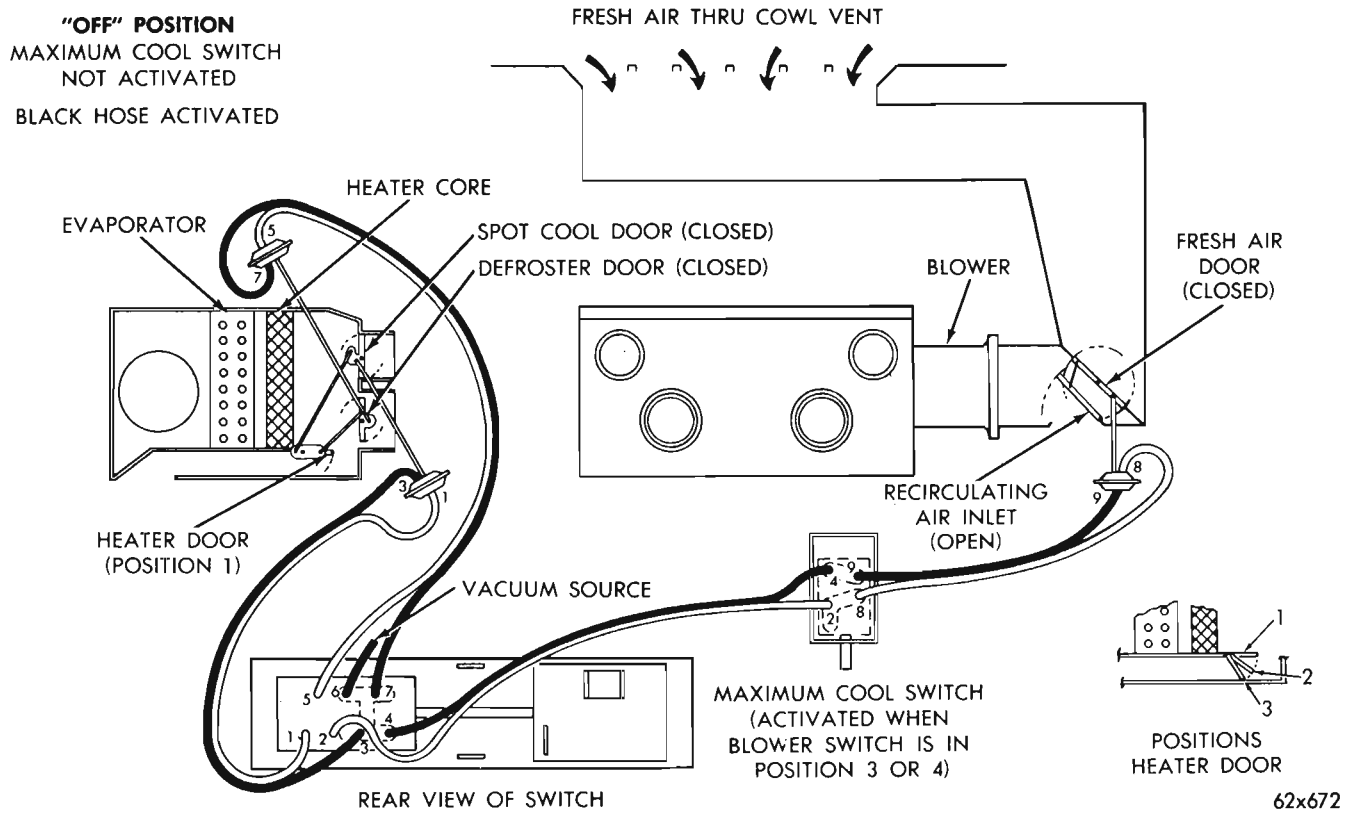


Fig. 4—Air Flow—Off Position

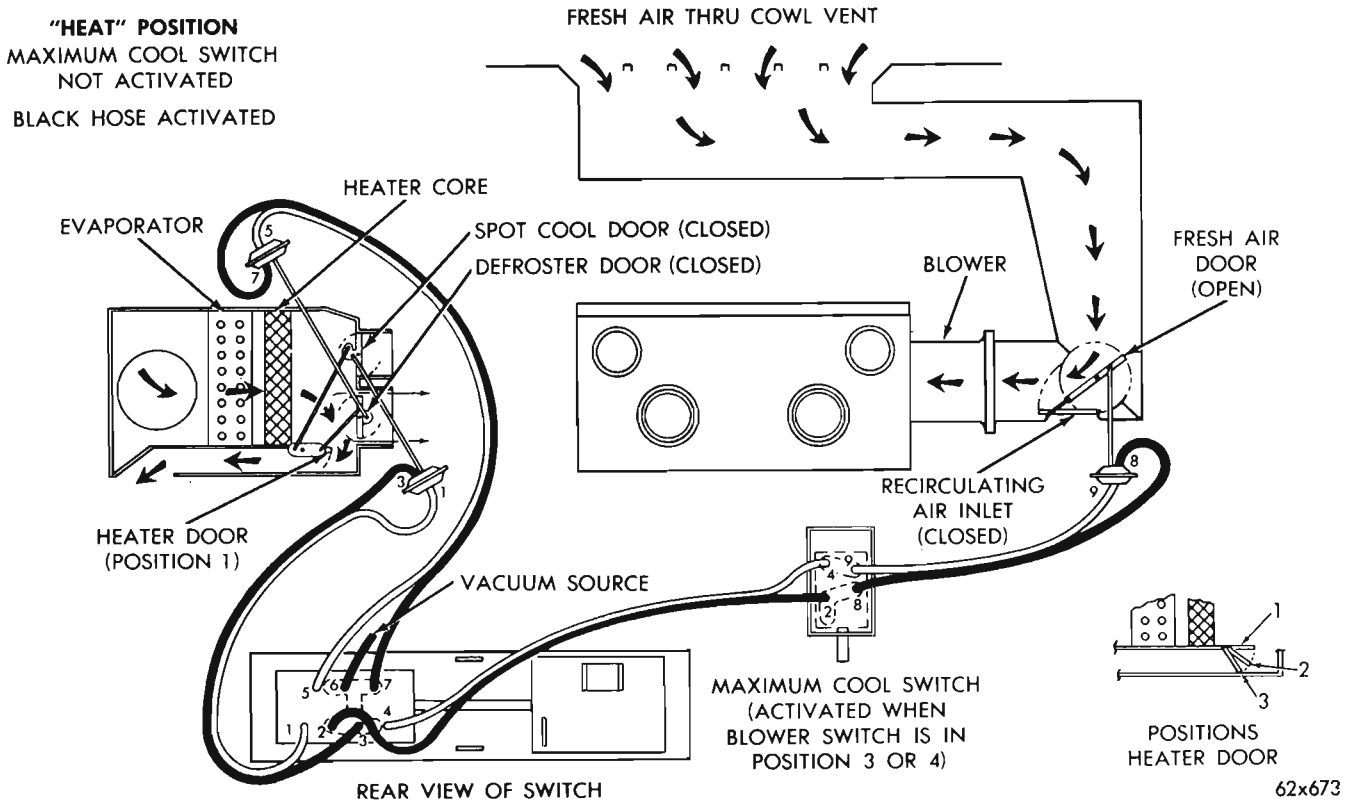


Fig. 5—Air Flow—Heat Position

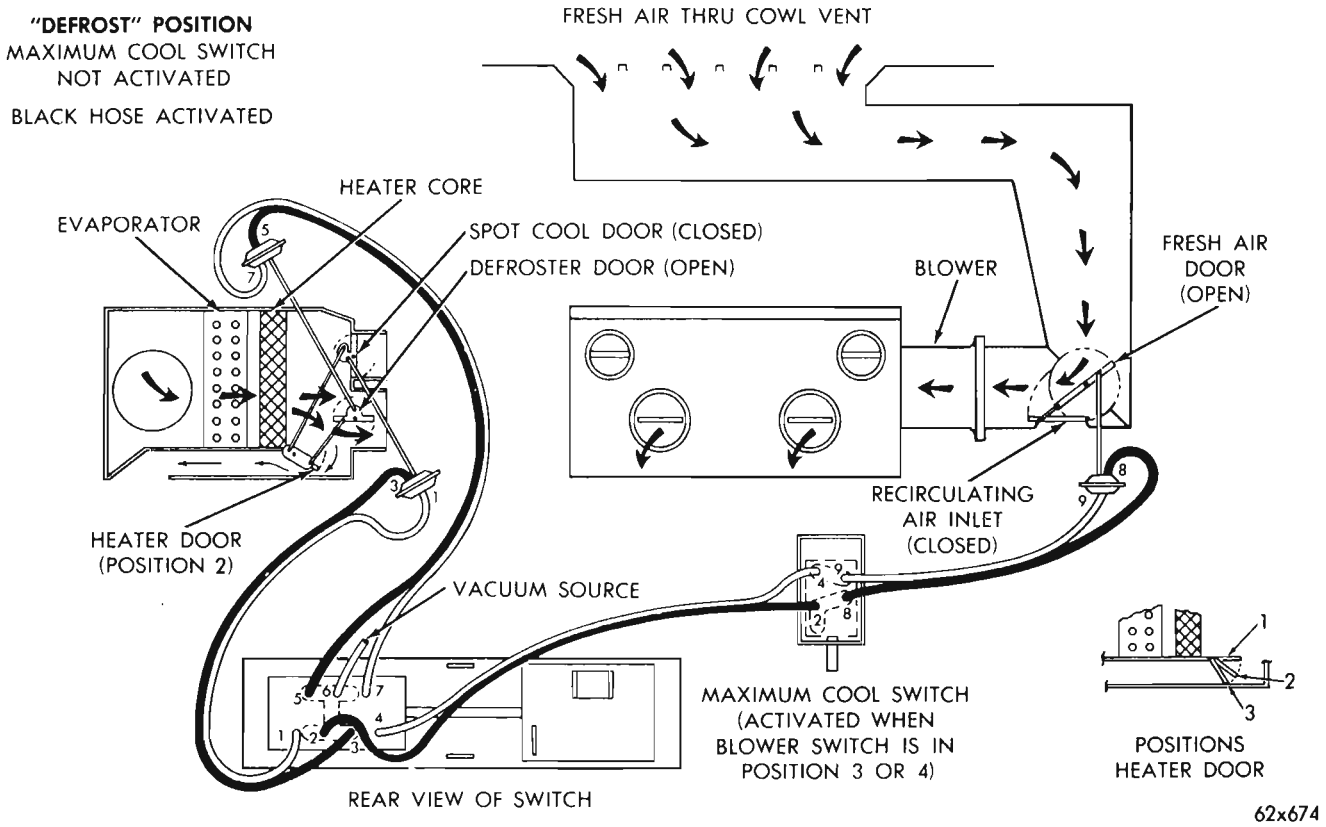


Fig. 6—Air Flow—Defrosting Position

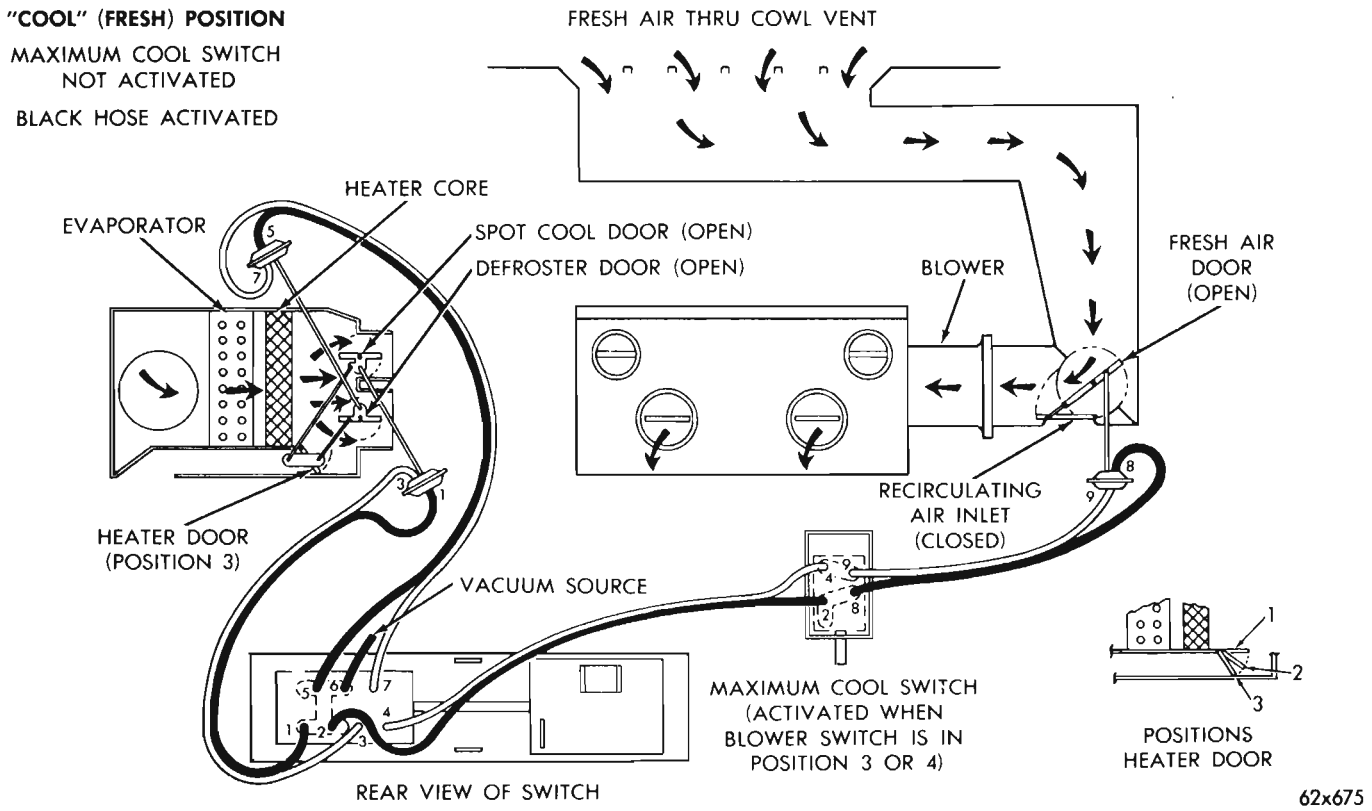


Fig. 7—Air Flow—Fresh Cool Position

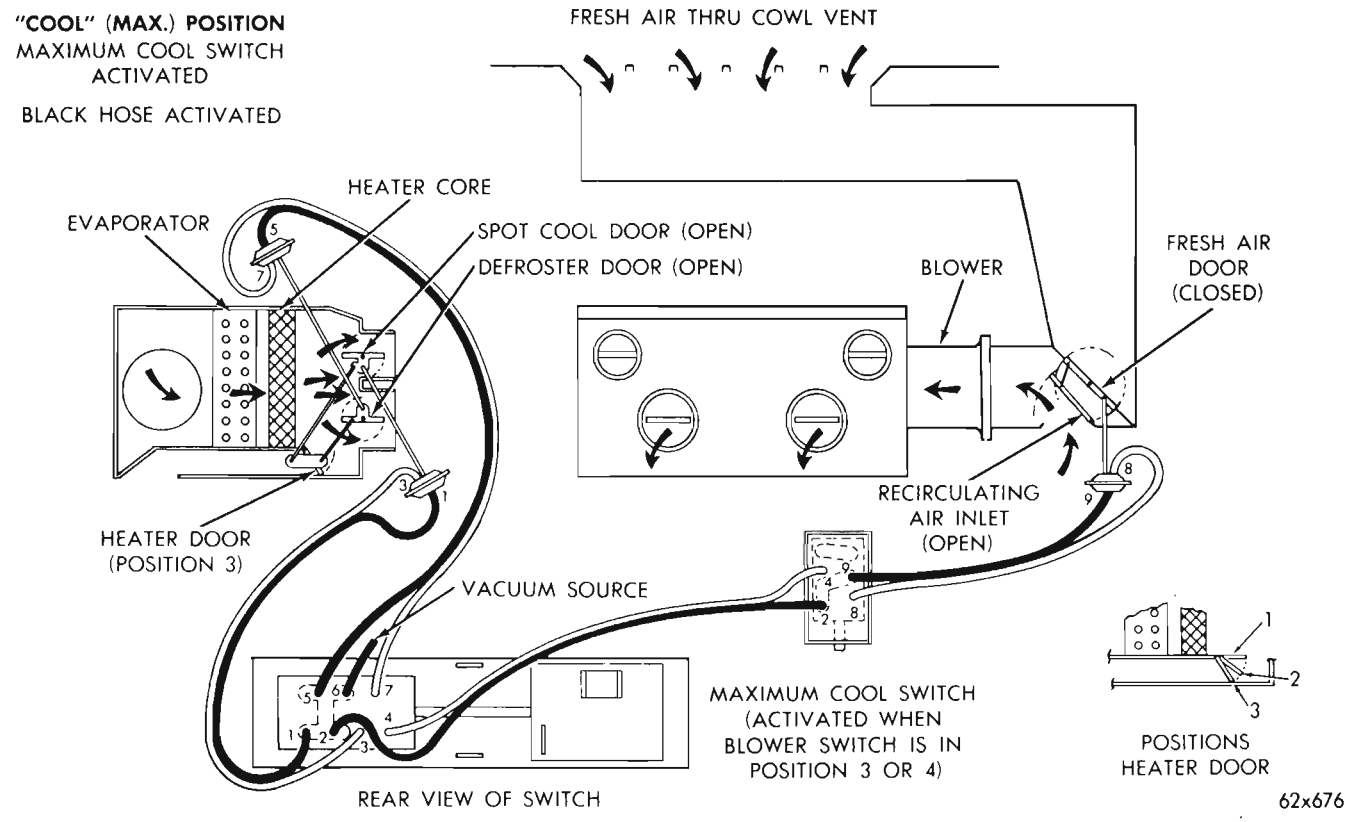


Fig. 8—Air Flow—Recirculating Cool Position

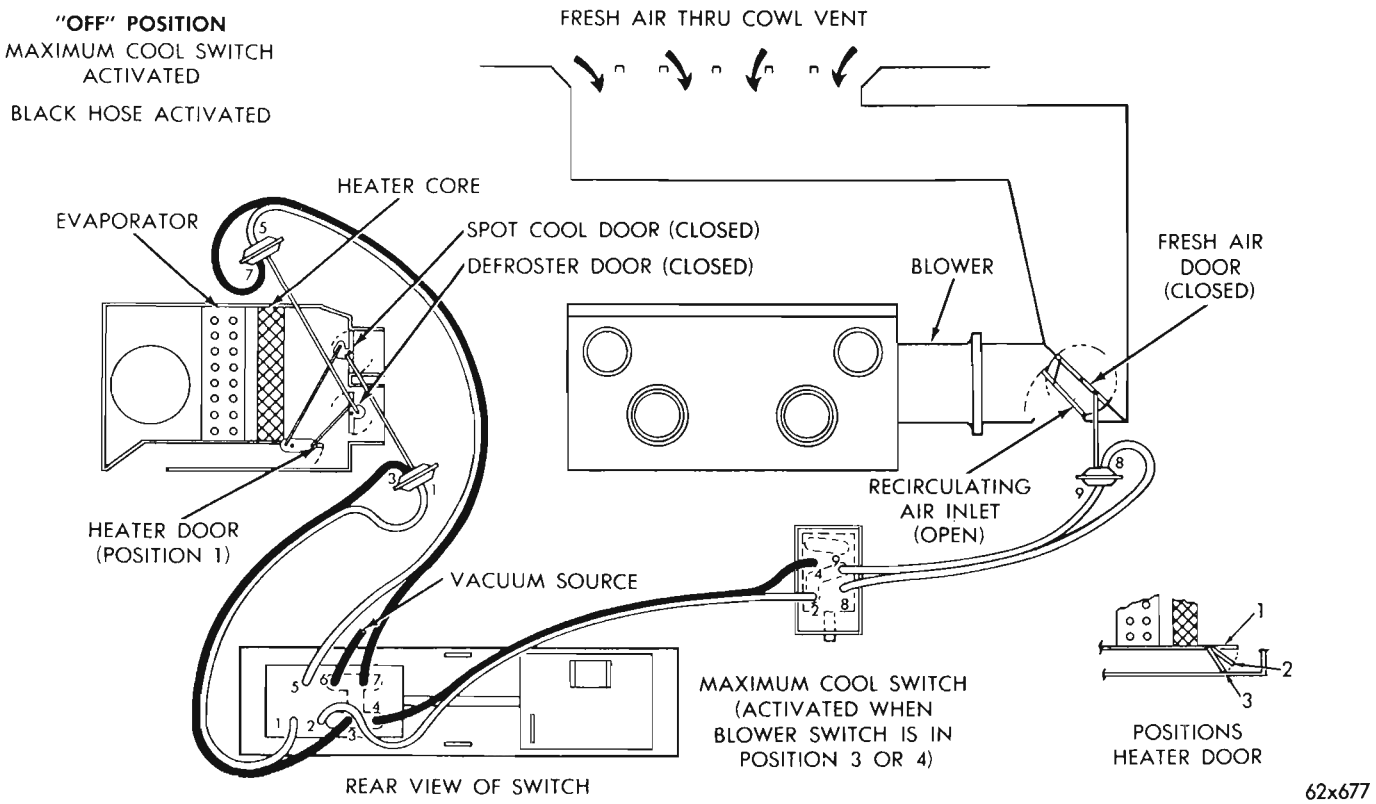


Fig. 9—Air Flow—Off

CIRCUITS		
CIR.	GA.	COLOR
C-1B	16	BLACK
C-1A	16	BLACK
C-2	16	DK. BLUE
C-2A	16	LT. BLUE
C-2B	16	LT. BLUE
C-2C	16	LT. BLUE
C-3B	16	PURPLE W/TRACER
C-3A	16	PURPLE
C-4	16	BROWN
C-5	16	DK. GREEN
C-6	16	TAN

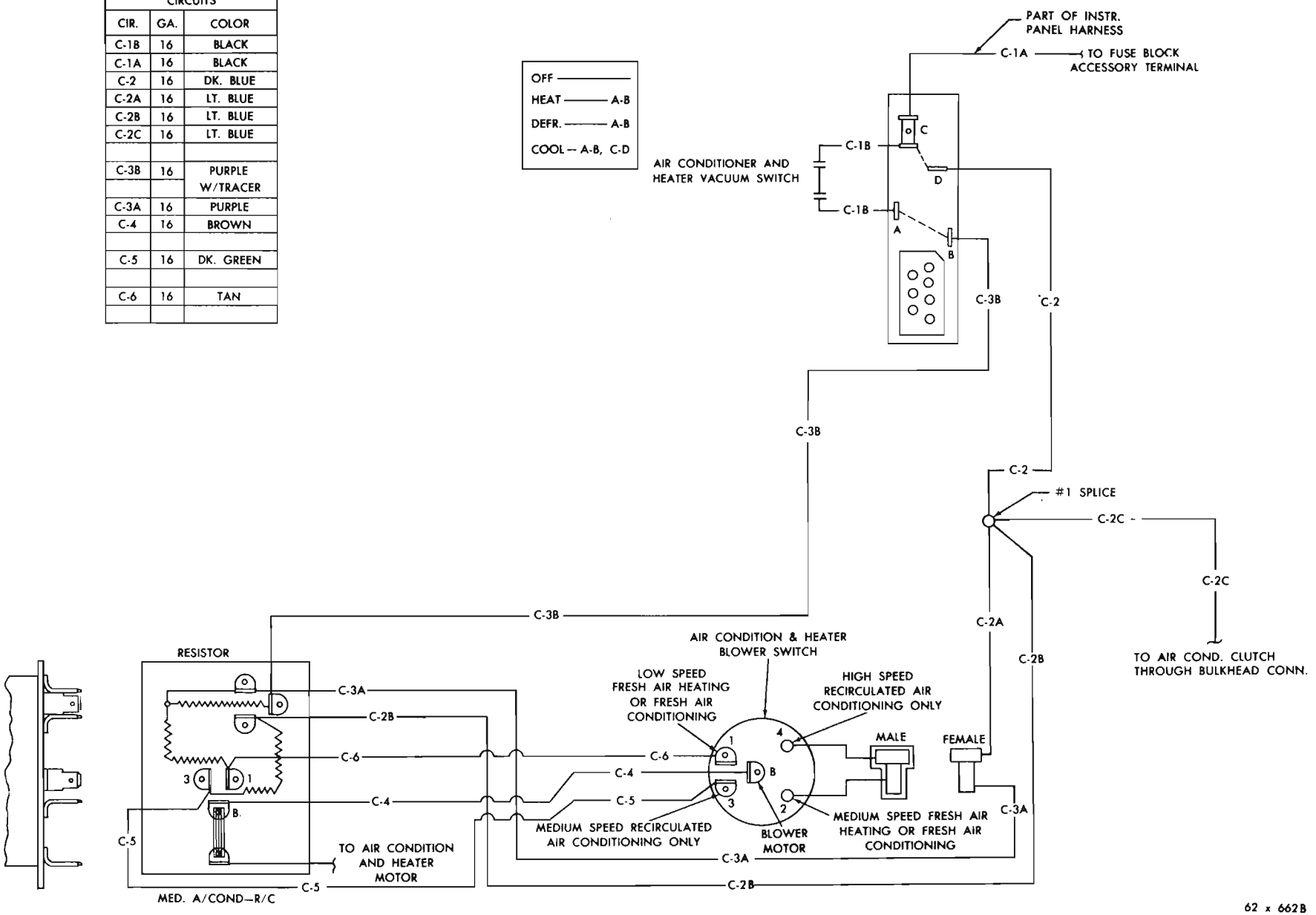


Fig. 10—Electrical Control Circuit

heating is desired. The only difference between the operation of the heat system with the "Heat" or "Defrost" buttons pushed in is the circulation of the discharge air. With the "Heat" button in, most of the air is discharged through the floor level. With the"Defrost" button in, most of the air is discharged through the instrument panel outlets.

2. ELECTRICAL CONTROLS AND CIRCUITS

With air conditioning there are two switches, the push button switch assembly controls the clutch circuit. The push button switch also controls the "Feed" circuit to blower motor speed control rotary switch mounted on the instrument panel.

Push Button Control

The power "feed" circuit is shown in Figure 10. A 20 ampere fuse in the fuse block heater trim controls the blower speeds and the clutch feed.

The clutch circuit is energized ("hot") only when the "Cool" push button is depressed. The power "feed" circuit to blower motor speed control switch is energized ("hot") when any button other than the "Off" button is depressed.

Blower Motor Speed Control Switch

The power "feed" line from the push-button switch to blower speed control switch is energized only when the ignition is on and any push button other than "Off" is depressed.

The blower speed control rotary switch has no off position.

Position No. 1 Low Speed and No. 2 Medium Speed are in the "heat" and "cool" range. Position No. 3 Medium and No. 4 High Speed are in the "cool" range (Fig. 2). The design of the blower control electrical circuit prevents the blower switch operation in positions No. 3 and No. 4 except when the "cool" push button is depressed.

Attached to the blower motor speed control switch is a maximum cool vacuum switch. This switch closes the fresh air door when the rotary movement of the speed control switch is turned to the No. 3 or 4 position.

3. THERMOSTATIC VALVES

Mounted on the face of the evaporator housing are two thermostatic valves (Fig. 11). These valves sense the temperature of the air leaving the heater core and modulate the valve which controls the water flow valve. The left-hand thermostatic valve or heat stat is for heating and defrosting operation. It is identified by two yellow dots on the end of the valve. The right-hand thermostatic valve or air conditioning stat governs reheating when the air conditioning is operating. This valve has two green dots on the end.

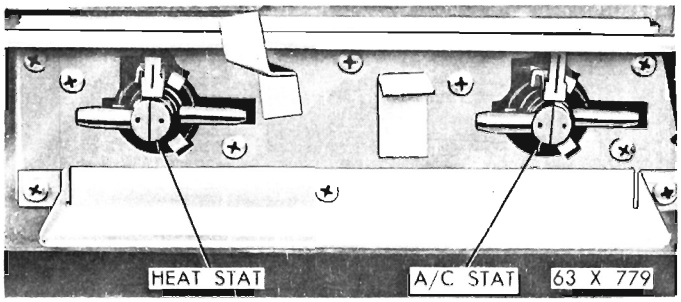


Fig. 11—Thermostatic Valves

The temperature control lever at the instrument panel is connected to both valves by a short control cable. Because the two stat valve levers are linked together, they both move when the temperature control lever is moved. Inside the evaporator housing, the lever operates a cam which varies the tension on a U-shaped bimetal thermostat spring. This spring opens and closes the vacuum valve in response to changes in the temperature of the air being discharged from the unit. Except for the contours of the cams, both thermostatic valves are identical. The cam shape determines the effective operating range of each valve.

Heat stat control. When either the defrost or heat button is pushed, the spot cooler doors are closed. The lever on the spot cooler shaft depresses the temperature selector switch plunger. This routes vacuum from the left-hand or heat stat to the water flow valve.

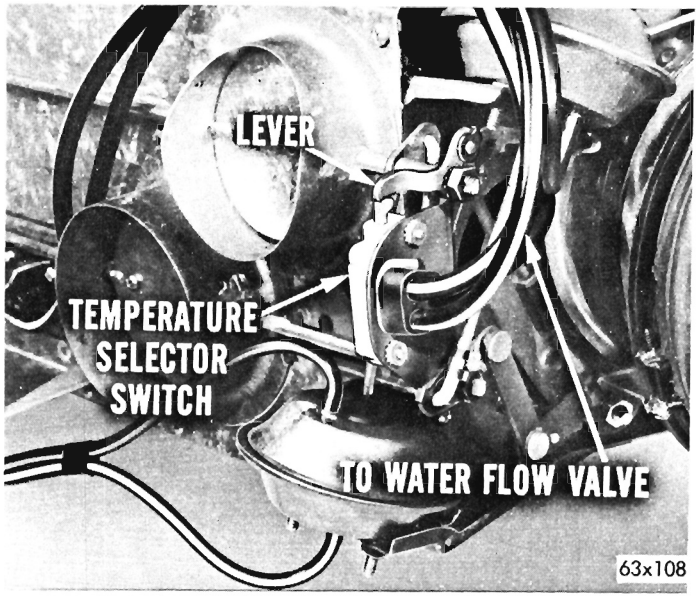


Fig. 12—Temperature Selector Switch

Air-Conditioning stat control. When the cool button is pushed, the spot cooler doors open. The lever on the spot cooler shaft releases the temperature selector switch plunger. Vacuum from the right-hand or air-conditioning stat is routed to the water flow valve.

4. TEMPERATURE SELECTOR SWITCH (Fig. 12)

It is necessary to have two thermostatic valves for the different heat requirements for heating and air conditioning. Although both valves operate continually, the vacuum from only one, controls the water flow valve at any given time. Vacuum from the proper thermostatic valve is routed to the water flow valve by the temperature selector switch. This switch is mounted on the right rear edge of the air conditioning housing.

Vacuum outlet hoses from both thermostatic valves are connected to the temperature selector switch.

The position of the switch determines which hose will supply the vacuum to control the water flow valve. A lever on the shaft for the spot cooler doors actuates the temperature selector switch.

5. OWNERS OPERATING INSTRUCTIONS (Plymouth Models)

The purchaser of an air-conditioning equipped vehicle should be instructed on proper operation of the controls at the time of new vehicle delivery. It should never be assumed that the new owner will study the Owner's Manual or that his experience with the past models provides a complete understanding of the new controls. Customer satisfaction can be increased and complaints minimized by instructing the owner on operation as well as his service responsibilities. The following suggestions cover special operating conditions and preventive service suggestions.

Fast Cool Down (Fig. 13)

Open the window if the vehicle has been sitting in the hot sun.

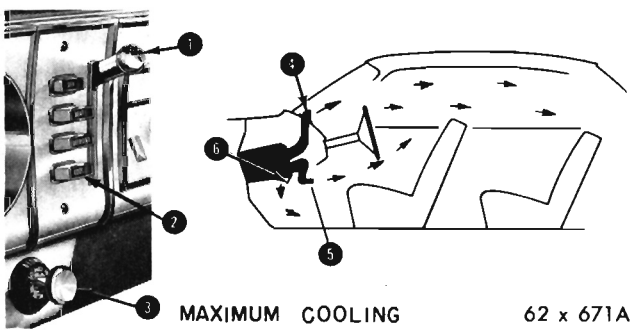


Fig. 13—Fast Cool Down (Typical)

(1) Move the temperature control lever to the extreme opposite position of the "warm" arrow. Start the engine.

(2) Push the "cool" button.

(3) Turn the "blower" knob to the No. 4 position (maximum-recirculated air).

(4) Raise the upper outlets and adjust the vanes to direct air to the area to be cooled.

(5) Adjust side outlets to direct air to body and lap area to be cooled.

(6) Floor air outlet doors may be manually opened to obtain additional cooling for the feet.

Motion of vehicle and blower will flush hot air from the vehicle.

After approximately one minute, close the windows.

Operation in Traffic

(1) If **extremely slow traffic** is encountered, 10 to 15 miles per hour, additional cooling can be obtained by operating the transmission in the lowest range (No. 1 button).

(2) For moderate traffic operation, 20 to 30 miles per hour, operate transmission in intermediate range (No. 2 button).

(3) At stop lights and other stops, press transmission ("N") Neutral button and increase engine speed with the foot accelerator.

(4) At higher speeds, press the transmission ("D") Drive button.

Normal Cooling (Cooling with Fresh Air)

When the temperature is comfortable, turn the "blower" switch to the No. 2 position (medium speed fresh air). If less cooling is desired turn the "blower" switch to the No. 1 position (low speed fresh air). Readjust the upper outlets to obtain indirect cooling and maintain comfort. If warmer air is desired, move the temperature control lever down. If desired the side outlets and floor outlets can be manually closed.

Cooling for Special Conditions

If the outside air is extremely humid or too warm for fresh air cooling, turn the "blower" switch to the No. 3 position (medium recirculated air). This is also recommended when driving through areas which are extremely dusty or have objectionable odors.

Use your air conditioner during the hay fever season to filter out the pollen and enjoy driving in complete comfort, choosing any of the four "blower" switch positions to suit the cooling requirements.

Off-Season Operation

During the off-cooling season, suggest to owners that they operate the air-conditioning system for at

least a few minutes once a week, with the "cool" button in and the temperature control lever in the "warm" position. This will cause the air-conditioning compressor to pump oil to the compressor seal, preventing the seal from drying out and causing loss of refrigerant.

Antifreeze Required for Summer Operation

Air conditioned vehicles must be protected with permanent type anti-freeze during the summer to + 15° or lower to prevent the heater core from freezing. **Do not use the same anti-freeze for more than one year.**

Bug Screens

Bug screens should not be installed on vehicles equipped with air conditioning. A bug screen installed in front of the condenser will reduce air flow and affect air conditioning performance. Under severe heat conditions a bug screen may cause the engine to overheat.

6. AIR CONDITIONING—OPERATION (Valiant Models)

The VALIANT Air-conditioner is available as a factory installed option and is an economy vehicle air conditioner which will provide the vehicle owner with the finest in summer comfort. Important improvements in passenger comfort and convenience are reflected in the many advance features of its design.

It is mounted on the bottom of the instrument panel (Fig. 14), centrally located and has no additional air ducts and the controls are integral with the unit. In this position, the unit is accessible for servicing and still allows the driver and front seat passenger enough leg room space. The remainder of the air conditioning system is conveniently located in the engine compartment. The air conditioner is used for cooling only; when heat is required, it has to be provided by a separate heating system.

Temperature Control

All of the controls necessary for operation of the air conditioning systems are located to the left of the air distribution grille convenient to the driver's right hand (Fig. 14). The controls are simple, easy to understand, and easy to operate. Only two adjustable controls are used to operate the entire system; a temperature control slide-type lever and a push-button operated blower speed switch.

The horizontal temperature slide-type lever is used to set the temperature of the air flowing from the evaporator coil. This lever is attached to a temperature control switch which activates the compressor.

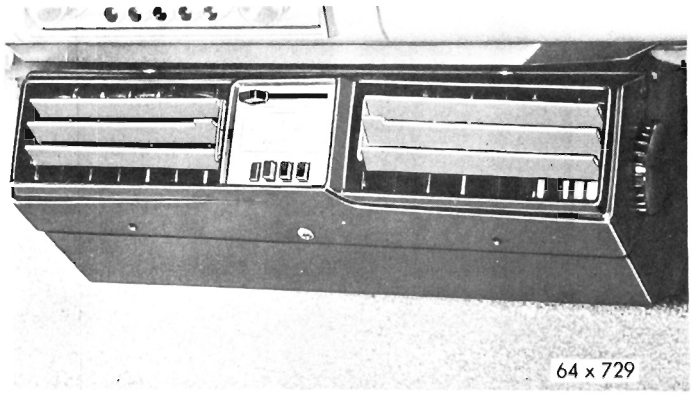


Fig. 14—Cool Aire Evaporator Installed

In the extreme left position, the switch is open and no cooling can be obtained. Moving the lever from the left side to the right side progressively increases the amount of cooling. Maximum cooling is obtained when the lever is at the extreme right side, as indicated by the arrow.

Blower Control

The blower switch is used to select three blower speeds and turn the system off. Four horizontally spaced push buttons, marked "Off", "Lo," "Med," and "Hi," offer a choice of cooling air flows to suit all requirements. High blower speeds provide rapid cooling in slow moving city traffic while lower speeds maintain comfortable temperatures on the highway or under mild climatic conditions. In addition to increased cooling capacity, the high-velocity air flows obtainable with the Cool Aire blower system give rapid relief from heat by creating an evaporative cooling effect on the vehicle occupants.

Air Distribution Control

The air distribution grille has multiple horizontal and vertical louvers. These can be adjusted manually to direct the flow of cool air up or down, left or right, for precise distribution throughout the vehicle. The vertical louvers are adjusted in groups of three by the four control levers at the top of the grille. The three horizontal louvers are divided in two groups (left and right) and are adjusted by the knob molded on the center louver. Additional air can be obtained by turning the dials located at either side of the unit. These can be set by the driver or passenger to suit individual comfort.

7. OWNERS OPERATING INSTRUCTIONS (Valiant Models)

With the engine operating, the following control settings may be used to cool the vehicle under various weather and driving conditions:

NOTE: Move the heater temperature control lever to the "Off" position. Push the "Off" button on the heater control switch, to make certain that the ventilation door is closed, preventing outside air from entering the vehicle.

Fast Cool Down

If the vehicle has been standing in the hot sun, move the temperature control lever to the extreme right for maximum cooling and press the "Hi" blower speed push button, drive with the windows open for two or three minutes to expel the hot air, then close the windows and the Cool Aire system will quickly provide a comfortable temperature.

Slow City Driving

When driving in traffic where there are frequent stops, move the temperature control lever to the extreme right for maximum cooling and press the "Hi" blower speed push button. In extreme heavy or slow moving traffic better results will be obtained when driving in intermediate (second) or low gear.

Cruising—Normal Warm Weather

When cruising on open highways where there are only intermittent stops, move the temperature control lever to obtain a comfortable temperature flowing from the evaporator distribution grille. Press the "Lo" or "Med" blower speed push button.

Cruising—Hot Weather

Move the temperature control lever to the extreme right for maximum cooling and press the "Hi" blower speed push button.

Fresh Air

With a factory-installed fresh air heater, PUSH the "Lo" button. The two independent fresh air vent doors, located under the instrument panel at the left and right side must be closed.

NOTE: On the initial cool-down or while driving through heavy traffic where maximum cooling capacity is required, the fresh air control should be closed.

Off-Season Operation

During the off-cooling season, suggest to owners that they operate the air conditioner system for at least five minutes once a week. This will cause the air-conditioning compressor to pump oil to the compresser seal, preventing the seal from drying out and causing loss of refrigerant.

IMPORTANT: To assist in maintaining proper engine temperature, when the outside temperature exceeds 100° F., it is recommended that while the air conditioner is in operation the engine idle period be limited to 10 minutes.

INSPECTION, TEST PROCEDURES AND DIAGNOSIS

Satisfactory performance of the combined air-conditioning and heating system is dependent upon proper operation and adjustment of all operating controls, as well as proper functioning of all refrigeration system units. The inspections, tests and adjustments should be used to locate the cause of a malfunction. The inspection and tests have been arranged in a logical sequence that has proved to be the surest and shortest route to accurate diagnosis. It is recommended that they be followed and performed in the order in which they are presented.

8. INSPECTION AND ADJUSTMENTS (Plymouth)

Operation of All Controls

Operating controls must be tested as described in the following sequence:

(1) Inspect the compressor drive belt tension—adjust if necessary, remove the radiator cap.

(2) Start the engine and adjust the engine speed to 1250 rpm. Use a reliable tachometer.

(3) Push the "Cool" button in, and move the temperature control lever to the top.

(4) Test the blower operation at all four positions. (See "Blower Switch Chart.")

BLOWER SWITCH CHART

	COOL HEAT		MAX. COOL*	
	1	2	3	4
	LOW	MED.	MED.	HIGH
OFF	OFF	OFF	OFF	OFF
HEAT	ON	ON	OFF	OFF
DEFROST	ON	ON	OFF	OFF
COOL	ON	ON	ON	ON

*The design of the blower control electrical circuit prevents the blower operation in the position No. 3 and 4 except when the cool button is depressed.

If the blower does not operate correctly, refer to "Electrical Control Circuit" (Fig. 10). Leave the blower in the No. 2 position.

(5) The compressor clutch should be engaged, the compressor operating, and the air conditioning system in operation. If the clutch does not engage, test the circuit. Refer to "Electrical Control Circuit" (Fig. 10).

Push Button Operation

Reduce the engine speed to normal idle. With the engine operating at idle speed, the vacuum will be high and the vacuum actuators should operate quickly. If the actuator operation is slow, inspect the source hose connection at the engine manifold. Push each button to test the over-all operation of the electrical and vacuum controls. The "Push Button Control Chart" summarizes the actions that should take place when each button is pushed.

If all controls operate in the proper sequence but action of dampers and doors is slow or incomplete, inspect for mechanical misalignment, binding or improper linkage adjustment.

The maximum cool vacuum switch is operated in position No. 3 and 4. Operation of this switch causes the fresh air door to close.

Water Valve

Test the water valve by momentarily disconnecting the hose from the outlet (lower) side of the water valve.

A slight spillage of water when the hose is removed is normal. Excessive water flow indicates that the valve is not closing properly. Remove the vacuum line at the water valve and if excessive water flow continues then water valve is faulty. If the water flow rate is acceptable with the vacuum line disconnected, this indicates an improperly adjusted control cable or faulty temperature thermostat. Adjust the control cable or replace the water valve or thermostatic valve assembly as necessary, and retest.

Radiator Cap

It is an absolute necessity for the 1964 air-conditioned vehicle to be equipped with a radiator cap having a holding pressure of 15 to 16 psi, for hot weather operation. If the radiator cap does not test within these specifications, replace with a cap which does.

Condenser

Inspect the condenser fins for obstructions by foreign matter. Clean if necessary. Any obstructions to the free flow of air across the condenser will decrease heat dissipation from the condenser, decrease the efficiency of the condenser, and in turn, decrease the evaporator's efficiency. These conditions result in increasing the discharge pressure and horsepower load on the engine. The use of a bug screen is not recommended as it, too, will decrease the free flow of air.

Be sure the fan shroud is properly positioned. (If so equipped.)

9. INSPECTION AND ADJUSTMENT (Valiant)

NOTE: If the vehicle is equipped with a heater, test the water temperature control valve.

Water Temperature Control Valve Test

Move the heater control lever on the instrument panel to the extreme "Warm" position, and then back to the "Off" position. At the same time, test control cable action and the movement of the water temperature control valve lever. The valve should be moved to the wide-open position and back to the fully closed position.

If the temperature control valve does not close completely, reposition the control cable housing in the retaining clip so that the valve does close completely.

Test the operating controls as described in the following sequence:

PUSH BUTTON CONTROL CHART

	OFF	HEAT	DEFROST	COOL	COOL	*OFF
FRESH AIR DOOR	CLOSED	OPEN	OPEN	OPEN	CLOSED	CLOSED—NO VACUUM
HEAT DOOR	OPEN	OPEN	BLEED	CLOSED	CLOSED	OPEN
SIDE OUTLET DOOR	CLOSED	CLOSED	CLOSED	OPEN	OPEN	CLOSED
UPPER OUTLET	CLOSED	CLOSED	OPEN	OPEN	OPEN	CLOSED
BLOWER SWITCH POSITION	1 OR 2	1 OR 2	1 OR 2	1 OR 2	3 OR 4	3 OR 4

*Fresh Air Door is under no vacuum in this position. Over-center spring will keep door closed.

(1) Remove the radiator cap.

(2) Move the heater temperature control lever to the "Off" position.

(3) Start the engine and adjust engine speed to 1250 rpm.

(4) Test the water valve by momentarily disconnecting the heater outlet hose at the upper side of the heater housing. A slight spillage of water when the hose is removed is normal. (The radiator cap was removed at the start of this test to minimize pressure in the cooling system.) A continuous flow of water indicates that the valve is not closing properly. This may be caused by an improperly adjusted control cable or a faulty valve. Readjust the control cable or replace the valve, as necessary, and retest.

Radiator Cap

It is an absolute necessity for the 1964 air-conditioned vehicle to be equipped with a radiator cap having a holding pressure of 15 to 16 psi, for hot weather operation. If the radiator cap does not test within these specifications, replace with a cap which does.

Condenser

Inspect condenser fins for obstructions by foreign matter. Clean if necessary.

Any obstructions to the free flow of air across the condenser will decrease heat dissipation from the condenser, decrease the efficiency of the condenser. These conditions result in increasing the discharge pressure and horsepower load on the engine. The use of a bug screen is not recommended, as it too will decrease the flow of air.

Inspect condenser for bent, or damaged fins. Bent fins on the condenser deflect air flow across the bent portions, decreasing the condenser area.

10. THE GAUGE SET MANIFOLD INSTALLATION AND TESTS

The Gauge Set Manifold is an indispensable test

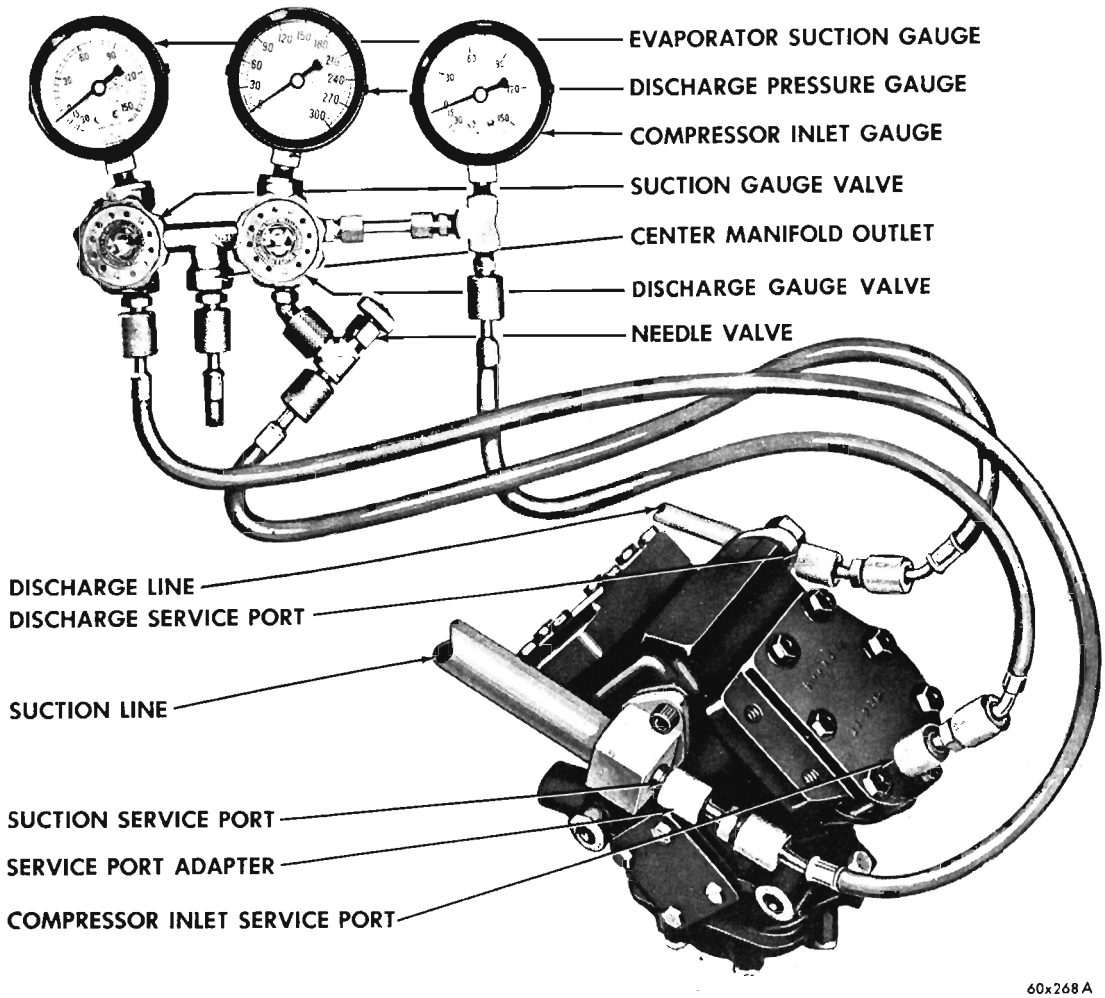


Fig. 15—Gauge Set Manifold Connections—Plymouth

and diagnosis instrument. The new gauge set manifold Tool C-3740 has two compound suction gauges and one discharge pressure gauge. Two accurately calibrated suction pressure gauges are required for the evaporator pressure regulator valve test. A modification kit Tool C-3741 contains all of the parts necessary to convert the previous gauge set manifold Tool C-3627 for testing the Air-Conditioning System. (Refer to Figs. 15 and 16).

Evaporator Suction Gauge at the left side of the manifold is calibrated to register 0 to 30 inches of vacuum and 0 to 150 psi. This gauge is connected to the suction service port of the compressor. A special service port adapter, supplied with the gauge set, provides the means of connecting the gauge set manifold hose to the service port. When the adapter is installed at the port and tightened, the stem of the valve in the service port is depressed, opening the service port valve.

Discharge Pressure Gauge at the center of the manifold is calibrated to register 0 to 300 psi. For all tests this gauge is connected to the discharge service port of the compressor. A service port adapter is used to make this connection. The needle valve, located below the discharge pressure gauge, is used to damp out gauge needle oscillations so that accurate readings can be obtained.

Compressor Inlet Gauge is mounted at the right side of the manifold. This mounting is for convenience only. There are no passages between this gauge and the gauge manifold. The compressor inlet gauge is calibrated to register 0 to 30″ of vacuum and 0 to 150 psi. This gauge and the evaporator suction gauge must be accurately calibrated so that the needles of both gauges are exactly at 0 before making test. The compressor inlet gauge is connected to the compressor inlet service port by a special service port adapter. **This gauge is used, when checking the EPR Valve on the Plymouth system, and** is not used on the Valiant Cool Air Conditioner (Fig. 16).

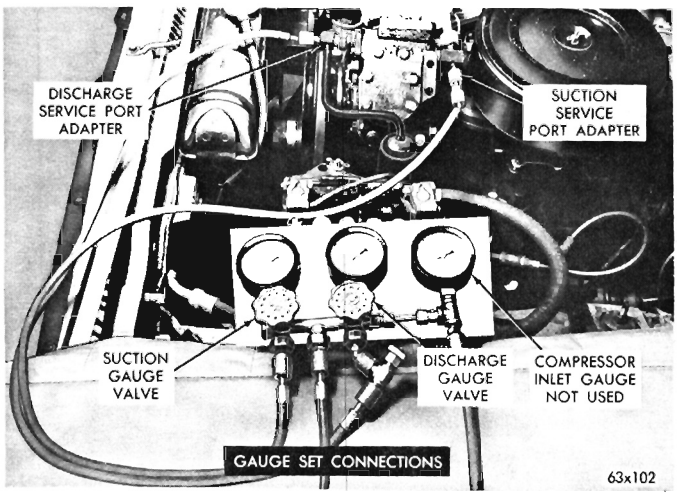


Fig. 16—Gauge Set Manifold Connections—Valiant

Center Manifold Outlet provides the necessary connection for a long service hose used when discharging the system, using a vacuum pump to "pull a vacuum" before charging the system, and for connecting the supply of refrigerant when charging the sytem. When performing the "Compressor Capacity Test," TEST 7, the hose is removed and a special test cap is installed in its place.

Manifold Gauge Valves should be closed when connecting the gauge set manifold to the service ports of the compressor. The suction gauge valve at the left is opened to provide a passage between the suction gauge and the center manifold outlet. The discharge gauge valve at the right is opened to provide a passage between the discharge pressure gauge and the center manifold outlet.

The detailed instructions for the proper use of the gauge set manifold are contained in the test covering each test and service operation employing these gauges.

TEST 1

TEST SYSTEM PRESSURE (Engine not Running)

Install the gauge set manifold. For identification of the test hose connections at service ports see Figures 15 and 16. After tightening the service port adapters, make sure that the needle valve located below the discharge pressure gauge is open. Purge air from the gauge hoses (Fig. 17) as follows:

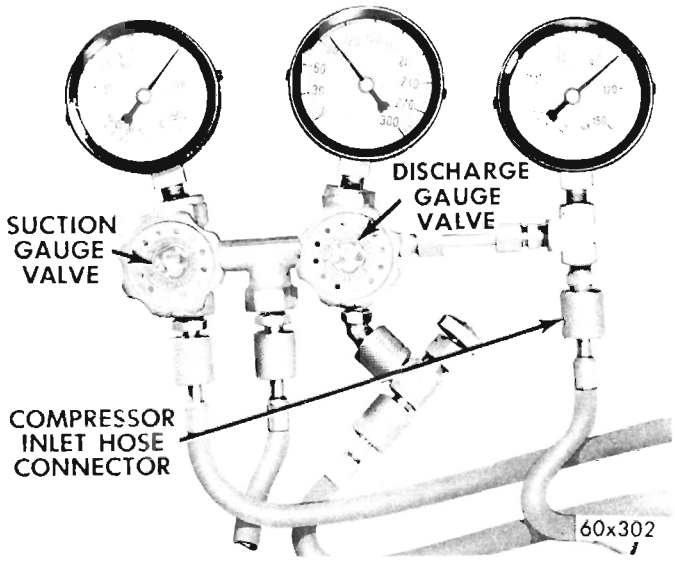


Fig. 17—Purge Gauge Hoses

(1) Open the suction gauge valve momentarily, then close it.

(2) Open the discharge gauge valve momentarily, then close it.

(3) Loosen the compressor inlet suction hose connection at the manifold momentarily, then tighten it.

NOTE: Step three not necessary with the Valiant Cool Aire Conditioner.

If the vehicle has been parked and the system not operating, the gauge pressure should be normal for temperature of the system. Refer to the "Temperature-Pressure Relationship Chart."

If no pressure is indicated on the gauges it means that the system is empty, due to a leak. It will be necessary to evacuate, charge with a sweep-test charge, locate and correct the leak, purge the test charge, replace the drier, vacuum the system and charge the system with the proper amount of refrigerant 12.

TEST 2

REFRIGERANT LEVEL

The system must be operated at high blower speed, when this test is made, and when adding to the charge with vehicle doors and windows open.

On Plymouth, the sight glass is an integral part of the receiver-strainer-drier. The outlet line (liquid) from the condenser must be attached to the connec-

TEMPERATURE-PRESSURE RELATIONSHIP CHART

(FOR REFRIGERANT 12)

Temp. F.	Press. PSI	Temp. F.	Press. PSI	Temp. F.	Press. PSI	Temp. F.	Press. PSI	Temp. F.	Press. PSI
0	9.1	35	32.5	60	57.7	85	91.7	110	136.0
2	10.1	36	33.4	61	58.9	86	93.2	111	138.0
4	11.2	37	34.3	62	60.0	87	94.8	112	140.1
6	12.3	38	35.1	63	61.3	88	96.4	113	142.1
8	13.4	39	36.0	64	62.5	89	98.0	114	144.2
10	14.6	40	36.9	65	63.7	90	99.6	115	146.3
12	15.8	41	37.9	66	64.9	91	101.3	116	148.4
14	17.1	42	38.8	67	66.2	92	103.0	117	151.2
16	18.3	43	39.7	68	67.5	93	104.6	118	152.7
18	19.7	44	40.7	69	68.8	94	106.3	119	154.9
20	21.0	45	41.7	70	70.1	95	108.1	120	157.1
21	21.7	46	42.6	71	71.4	96	109.8	121	159.3
22	22.4	47	43.6	72	72.8	97	111.5	122	161.5
23	23.1	48	44.6	73	74.2	98	113.3	123	163.8
24	23.8	49	45.6	74	75.5	99	115.1	124	166.1
25	24.6	50	46.6	75	76.9	100	116.9	125	168.4
26	25.3	51	47.8	76	78.3	101	118.8	126	170.7
27	26.1	52	48.7	77	79.2	102	120.6	127	173.1
28	26.8	53	49.8	78	81.1	103	122.4	128	175.4
29	27.6	54	50.9	79	82.5	104	124.3	129	177.8
30	28.4	55	52.0	80	84.0	105	126.2	130	182.2
31	29.2	56	53.1	81	85.5	106	128.1	131	182.6
32	30.0	57	55.4	82	87.0	107	130.0	132	185.1
33	30.9	58	56.6	83	88.5	108	132.1	133	187.6
34	31.7	59	57.1	84	90.1	109	135.1	134	190.1

If pressures are normal, proceed with the next test and adjustment.

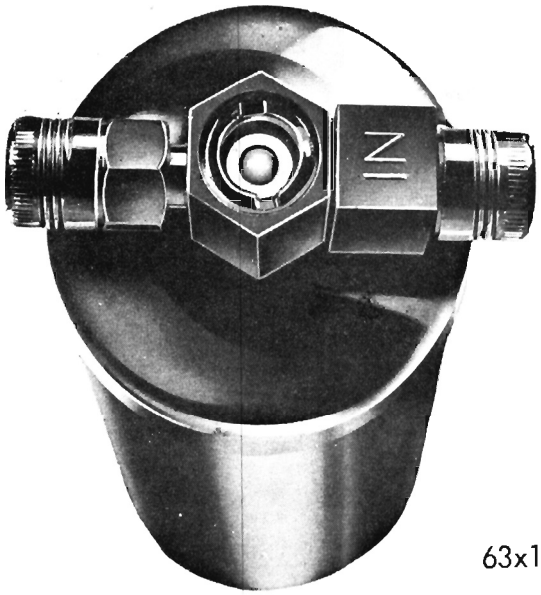


Fig. 18—Sight Glass (Plymouth)

tion marked IN. The word IN is stamped on the top face of the inlet connection (fig. 18). If the receiver-strainer-drier is reversed and the lines are connected wrong, the system must be purged, the lines reversed and the system recharged.

Block the air flow across the condenser to raise the discharge pressure to 225 to 250 psi, and check the sight glass for foam. There should be no foam. If sight glass is clear, remove the air restriction from the condenser and allow the discharge pressure to return to normal.

If the foam shows in the sight glass when the discharge pressure is 225 to 250 psi, it indicates the system is low on refrigerant. The proper amount of refrigerant required to complete a full charge may be added to the system as follows: Maintaining the discharge pressure at 225 to 250 psi, add refrigerant gas through the suction side of the system until foam is cleared from sight glass, then add exactly one-half (½) pound of refrigerant.

NOTE: The sight glass used with Valiant Cool Aire Conditioner has no arrow. With the engine operating at 1250 rpm, check temperature on the inlet side and on the outlet side of the receiver-strainer-drier (Fig. 19). If the temperature is the same on both ends, this indicates that the unit is functioning properly. However, if the temperature is cooler on the outlet end than it is on the inlet end, the receiver-strainer-drier is faulty (partially plugged) and must be replaced, purge the refrigerant from the system, replace the receiver-strainer-drier and recharge.

TEST 3

TESTING THE SYSTEM FOR LEAKS

The Leak Detector Torch Tool C-3569 is a propane gas-burning torch used to locate a leak in any part of the refrigeration system. Refrigerant gas drawn into the sampling or "snifter" tube will cause the flame to change color in proportion to the size of the leak. A very small leak will produce a flame varying from yellowish-green to bright green. A large leak will produce a brilliant blue flame.

CAUTION: Do not use the lighted detector in any place where explosive gases, dust or vapors are present. Do not breathe the fumes that are produced by the burning of refrigerant gas. Large concentrations of refrigerant in the presence of a live flame become dangerously toxic. Observe the flame through the window of the burner shield, not through the top of the shield.

If the flame remains bright yellow when the tester is removed from the possible leak point, insufficient air is being drawn in through the sampling tube, or the reaction plate is dirty.

(1) Open the torch valve until you hear a faint hiss of escaping gas. Light the test torch and adjust the valve until the flame is very small. A small flame will detect large as well as small leaks, whereas a large flame will detect only large leaks. As soon as the reaction plate seen through the window in the burner shield becomes red hot, the tester is ready for use.

(2) Examine all tube connectors and other possible leak points by moving the end of the sampling hose from point to point. Since refrigerant 12 is heavier than air, it is good practice to place the open end of the sampling hose directly below the point being tested. Be careful not to pinch the sampling tube since this will shut off the air supply to the flame and cause a color change.

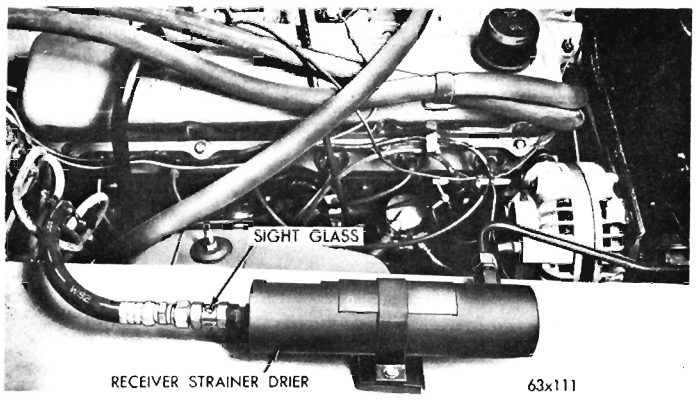


Fig. 19—Sight Glass (Valiant)

(3) Watch for a change in the color of the flame. Small leaks will produce a green color and large leaks a bright blue color. If leaks are observed at the tube fittings, tighten the connection, using the proper flare wrenches, and retest.

If the system is free of leaks, or after correcting a leak, if no air conditioning components have been removed, add necessary refrigerant as described under TEST 4 "Correcting Low Refrigerant Level". If any parts of the refrigerant system were disconnected, remove the sweep test charge. Close the refrigerant manifold valve so that any refrigerant remaining in the container is sealed. Remove the long test hose from the refrigerant manifold. Insert the free end of this test hose into an exhaust system outlet. Open the right-hand gauge set manifold valve a fraction of a turn to let the sweep-test charge escape slowly. Allow the system to discharge until the discharge pressure gauge registers zero. Open the left-hand gauge valve to allow any refrigerant trapped in the suction side of the system to escape.

TEST 4

CORRECTING LOW REFRIGERANT LEVEL

Since the refrigeration system is completely sealed, refrigerant level will not be low unless there is a leak in the system or refrigerant has been allowed to escape by depressing one of the service port valves. For detailed instructions on the proper procedure for checking refrigerant level, refer to "Refrigerant Level". TEST 2.

Before adding refrigerant where cause of low level is not known, the system should be tested for leaks. Assuming no leaks are present, or that leaks have been corrected without discharging the system, proceed with partial charge.

Install and connect the gauge set manifold valves, as shown in Figure 20.

(1) Close both of the gauge set manifold valves. Open the gauge set manifold needle valve.

(2) Connect the evaporator suction gauge test hose to the suction service port of the compressor, the dis-

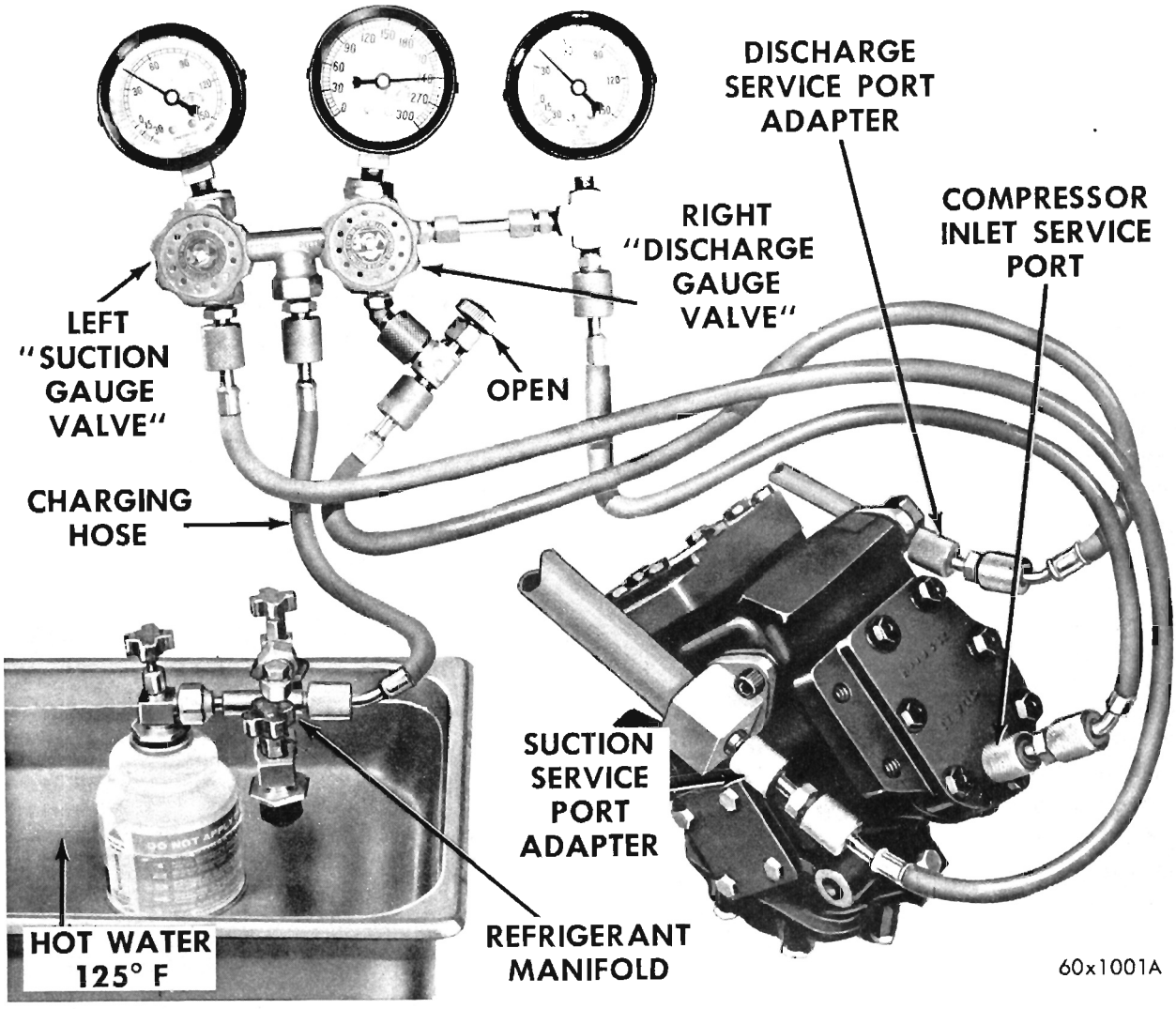


Fig. 20—Adding Partial Refrigerant Charge

charge gauge test hose to the discharge service port of the compressor.

(3) Connect one end of the long test hose to the center manifold outlet, the other end to the refrigerant dispensing manifold.

(4) Close two of the dispensing manifold valves and open the remaining dispensing manifold valve. Remove the protective cap from the opened valve.

(5) Screw a can of refrigerant 12 to the opened manifold valve. Be sure the gasket is in place and in good condition. Tighten the refrigerant can and the manifold locking nut to insure a good seal. Do not over-tighten since 6 to 8 foot pounds is sufficient if the gasket is in good condition.

(6) Turn the manifold valve (above the refrigerant can) completely clockwise to puncture the can. This closes the valve and seals the refrigerant in the can.

(7) Place the refrigerant in a large pan of water heated to 125°F. Place pan of water containing the refrigerant can on an accurate scale Tool C-3429 so that the amount of refrigerant added can be weighed. Open the refrigerant manifold valve.

(8) Purge all air from test hoses. Air in the system will be trapped in the condenser causing abnormally high discharge pressures and interfering with condensation of the refrigerant.

a. Loosen the test hose adapters at both the suction service port and the discharge service port.

b. Loosen the charging hose connection at the gauge set manifold. This will purge air from the charging hose. Tighten the connection as soon as the air is purged.

c. Open the left gauge set manifold valve to purge the air from the suction service test hose. Close the valve and tighten the test hose adapter at the suction service port.

d. Open the right gauge set manifold valve to purge the air from the discharge test hose. Close the valve and tighten the discharge test hose adapter at the discharge service port.

Operate the engine at 1250 rpm with the vehicle doors, windows open and the hood up.

On **Plymouth** push in the "Cool" button, blower on the number 2 position.

On Valiant **Cool Aire** set the evaporator temperature control lever to the coolest position, push in the "Hi" blower button.

If necessary, block the condenser to maintain a discharge pressure of 225 to 250 psi. The system must be charged through the evaporator suction service port as follows:

(9) Slowly open the suction service gauge valve. Meter flow of refrigerant by adjusting the suction service gauge valve so that the pressure registered at the suction service gauge does not exceed 50 psi. **Keep the refrigerant container upright.**

(10) Add refrigerant gas until there is no foam visible at the sight glass. As soon as all foam clears, note the weight registered on the refrigerant scale.

(11) Watch the refrigerant weighing scale and add **exactly** ½ pound more refrigerant to the system. Close the suction gauge valve.

NOTE: Too much refrigerant in the system can cause abnormally high discharge pressures. Care must be used so that exactly ½ pound of refrigerant is added after foam clears in the sight glass.

(12) Close the dispensing manifold valve. Remove the test hoses and adapters from the service ports of the compressor, and install the protective caps at the service ports.

TEST 5

OVER-ALL PERFORMANCE TEST

Humidity (the amount of moisture in the air) has an important bearing on the temperature of the air delivered to the vehicle's interior. This is true of all air-conditioned systems whether in home, office or vehicle. It is important to understand the effect humidity has on the performance of the system. When humidity is high, the evaporator has to perform a double duty. It must lower the air temperature and the temperature of the moisture carried in the air. Condensing the moisture in the air, transfers a great deal of heat energy into the evaporator fins and tubing. This reduces the amount of heat the evaporator can absorb from the air. In other words, high humidity greatly reduces the evaporator's ability to lower the temperature of the air delivered to the vehicle interior.

Evaporator capacity used to reduce the amount of moisture out of the air entering the vehicle adds materially to the comfort of the passengers. However, an owner may expect too much from his air-conditioning system on humid days. A performance test is the best way to determine whether or not the system is performing up to standard. This test also provides valuable clues to the possible cause of trouble.

The preliminary inspections in TESTS 1 thru 4 outlined previously should be made before the "Over-All Performance Test". Install gauge set, as shown in Figures 15 and 16.

NOTE: Air temperature in test room must be 75° F minimum for this test.

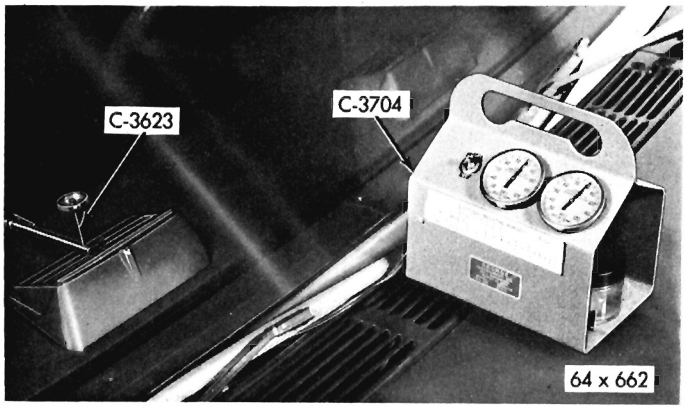


Fig. 21—Psychrometer and Thermometer (Typical)

Performance Test (Plymouth)

Start the engine, open the windows, the temperature control lever must be in the off position.

Push in "Cool" button, turn blower switch to position No. 2. The floor air doors should be fully open and the right and left side outlet cooler grilles fully open and directed straight back.

Adjust engine speed to 1250 rpm. Arrange the gauge set manifold hoses and tachometer leads to allow the hood to be lowered, and close the hood.

Place the motor-driven psychrometer Tool C-3704 at the cowl inlet opening (Fig. 21). Distilled water should be used with this meter to prevent drying out and hardening the wet sock.

Place the thermometer Tool C-3623 fully into the right outlet grille opening. The left outlet should be fully extended and directed towards the rear of the vehicle.

Operate the air-conditioning system until a stabilized condition on the gauges and thermometers has been established. One of the most important steps in making the over-all performance test is that the engine must be operated at 1250 rpm for approximately five minutes to allow all the under-hood components of the system to reach their operating temperature.

Partially close the needle valve, located below the discharge pressure gauge, to minimize oscillation of the pointer. Do not close the needle valve completely since this would prevent the discharge pressure gauge from registering pressure.

This test should be performed with the discharge pressure from 190 to 210 psi. The 190 to 210 pound pressure is for **test puposes only.** To increase pressure restrict the air flow across the condenser using cardboard, paper, etc. to decrease pressure, increase air flow across condenser with external floor fans.

Observe and record both the "Inlet Dry Bulb Temperature" and "Inlet Wet Bulb Temperature" as registered on the psychrometer.

Observe and record the "Discharge Air Temperature" registered by the thermometer at the right hand grille outlet.

From the "Performance Temperature Chart" (Fig. 22), determine the maximum allowable discharge air temperature for the prevailing "Dry" and "Wet" bulb temperatures recorded. If the vehicle's discharge air temperature is at or below the temperature given on the Performance Chart, the air-conditioning is delivering its cooling capacity. However, to assure trouble-free operation, continue with the "Evaporator Pressure Regulator," TEST 6.

If the discharge air temperature at the outlet grilles is above the maximum allowable on the Performance Chart, perform the following operations in the order indicated until proper performance is obtained.

(1) "The Evaporator Pressure Regulator Test."

(2) "The Compressor Capacity Test."

(3) "The Expansion Valve Test."

COOL AIRE Performance Test (Valiant)

(1) Start the engine and operate at 1250 rpm.

(2) Test both the heater control button and temperature control lever to make sure that they are in "off" position.

(3) Push the air conditioning blower on "Hi".

(4) Move the air conditioning control lever to the extreme right for maximum cooling.

(5) Place thermometer Tool C-3623 in the evaporator outlet distribution grille (Fig. 23).

AIR CONDITIONING PERFORMANCE CHART

	WET BULB INLET AIR TEMPERATURE																																													
	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
DRY-BULB TEMP 75° TO 110°	MAXIMUM DISCHARGE AIR TEMPERATURE																																													
	41	41	41	41	41	42	42	42	42	42	43	43	43	43	44	44	44	45	45	46	48	49	50	51	52	53	54	55	56	56	57	57	58	59	60	61	62	63	64

63 X 773A

Fig. 22—Performance Temperature Chart



Fig. 23—Checking Temperature at Outlet Grille

(6) Close the vehicle doors and windows.

(7) Observe the suction pressure gauge. As suction pressure lowers due to the cooling of the evaporator, the clutch should disengage when the pressure drops to approximately 10-15 psi. The clutch should re-engage as the suction pressure increases to approximately 35 psi.

(8) Observe the thermometer temperature. It should register between 30-35 degrees F. depending on the ambient temperature. If the thermometer lowers to these temperatures, the system is functioning properly and requires no further tests.

If the system fails to pass the performance test, proceed with:

a. "The Compressor Capacity Test."

b. "The Expansion Valve Test."

TEST 6

EVAPORATOR PRESSURE REGULATOR VALVE TEST (Plymouth)

The "EPR" valve is calibrated to produce the maximum "cooling" possible without causing frost or ice on the evaporator fins and tubing. If for any reason the factory calibration has been disturbed, the "EPR" valve may restrict the flow of refrigerant at an evaporator pressure which is either too high for maximum performance or too low to prevent coil freeze up.

The evaporator pressure regulator test determines whether or not the valve is functioning properly.

This test is not necessary as the "EPR" valve is not used on the Valiant "Cool Aire".

EPR Valve Test Conditions

Normally, this test is performed after completion of the Over-all Performance Test. The gauge set manifold will be connected, as shown in Figures 15 and 16.

Adjust engine speed to 1250 rpm. Close the hood for this test. Open the windows.

Turn the blower switch to position No. 2, push the "Cool" button.

The heat load on the evaporator will soon call for continuous operation of the refrigeration system. The "EPR" valve will open and the pressure at both the suction port and the compressor inlet service port will be approximately the same. It is normal for the compressor inlet pressure to be slightly lower than the evaporator suction pressure.

Observe the evaporator suction gauge and the compressor inlet gauge. Both should register 26 psi or slightly higher. This indicates that the "EPR" valve is open. The next step is to determine the minimum evaporator suction pressure maintained in the suction line by the "EPR" valve.

The "EPR" valve action can be accelerated by reducing the heat load on the evaporator. This is accomplished by turning the blower switch to position No. 1 ("Low-Speed"), thus reducing the volume of air passing through the evaporator. Immediately the evaporator will start to get colder. It is necessary to watch both suction gauges for the following reactions.

(1) Pressure registered at the evaporator suction gauges will become progressively lower.

(2) At the same time the compressor inlet gauge will start to fluctuate. This fluctuation is caused by the alternately opening and closing of the "EPR" valve. It indicates that suction pressure is reduced to the point where it just about balances the internal gas pressure in the bellows. The "EPR" valve is actually operating as a modulating valve.

(3) When fluctuation at the compressor inlet gauge stops and the pressure registered drops steadily, the "EPR" valve is maintaining minimum suction line pressure. Allow pressure registered at the compressor inlet gauge to drop 15 psi or lower, then read the evaporator suction gauge.

NOTE: If, and only if the compressor inlet pressure will not pull down to 15 psi, increase engine speed to approximately 2000 rpm.

(4) The suction gauge pressure should be 22 to 26 psi. This indicates that the suction pressure maintained by the "EPR" valve is correct. Again, determine the pressure at which the valve is fully open.

(5) Turn the blower switch to position No. 2, push the "Cool" button to increase the heat load on the evaporator. This will increase suction pressure, causing the "EPR" valve to open fully.

(6) Watch both the evaporator suction and the compression inlet pressure gauge. The pressure registered at the compressor inlet gauge will increase quite rapidly. Both suction gauges should again stabilize

at a pressure of 26 psi or slightly higher within a few minutes.

If the minimum suction pressure registered step (4) above is 22 to 26 psi and the suction pressure registered with the valve fully open step (6) above is 26 psi or slightly higher, the "EPR" valve is functioning normally. A system which passes both the Over-All Performance Test and the "EPR" Valve Test requires no further tests.

Suction Pressure Above 26 psi. If the minimum suction pressure is higher than 26 psi step (4) above, the evaporator will not get as cold as it should for maximum performance. It will be necessary to replace the "EPR" valve. Repeat the "EPR" valve test and the Performance Test.

Suction Pressure Below 22 psi. If suction pressure goes below 22 psi step (4) above, the evaporator is too cold. The correction is to replace"EPR"valve and repeat the "EPR" valve test.

If the system failed to pass the Over-All Performance Test but passed the "EPR" valve test, proceed with the Compressor Capacity Test 7.

TEST 7

COMPRESSOR CAPACITY TEST

The Over-All Performance Test and the Evaporator Pressure Regulator Valve Test should be performed before testing the compressor capacity. These tests are made with the system fully charged with refrigerant. It is necessary to discharge the system before making the Compressor Capacity Test. It is also necessary to discharge the system in order to perform the Expansion Valve Test. It is recommended that tests be made in the order in which they are presented in this manual. Experience has proven to be the surest and quickest way to locate and correct the cause of unsatisfactory performance.

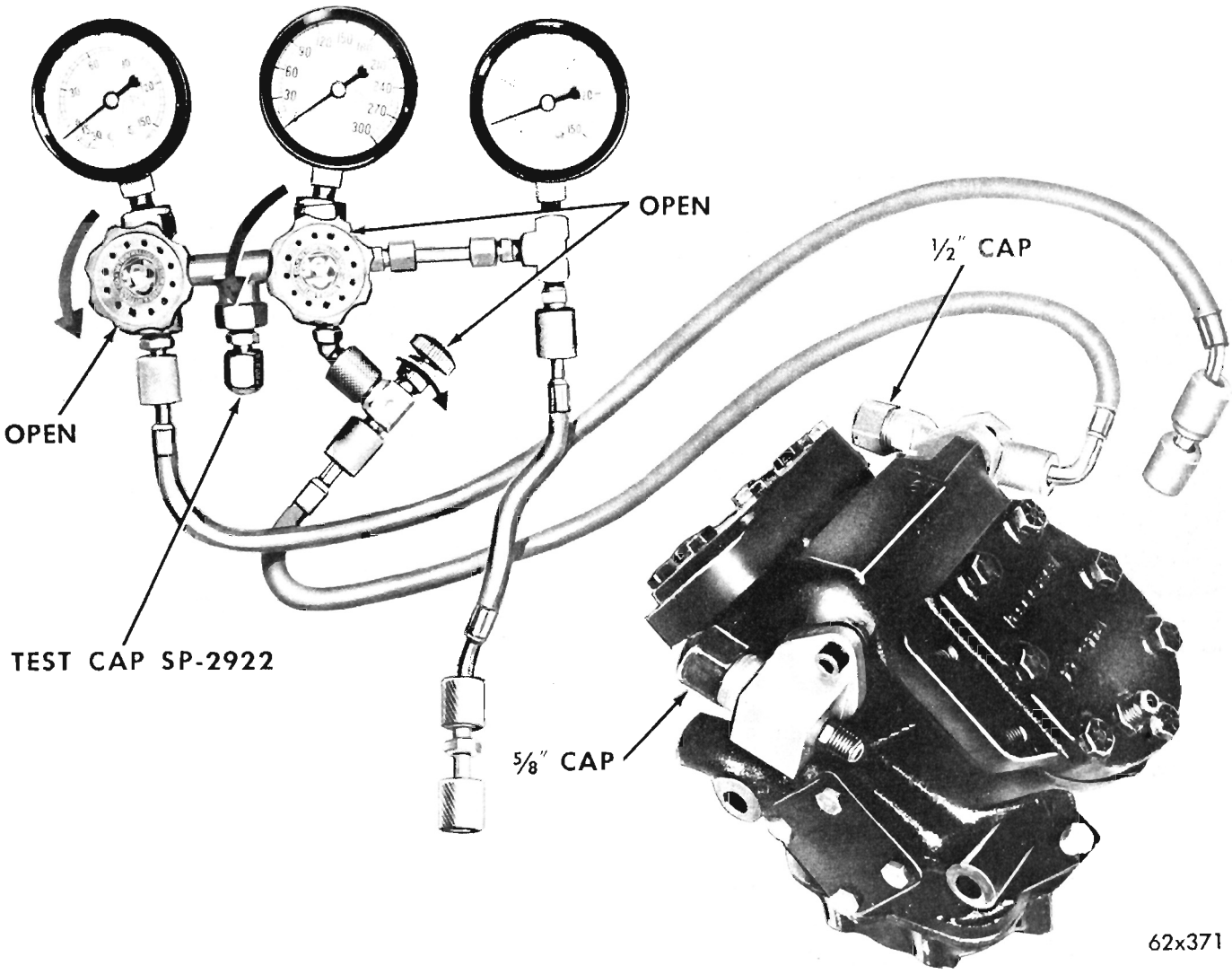


Fig. 24—Compressor Test Connections (Plymouth)

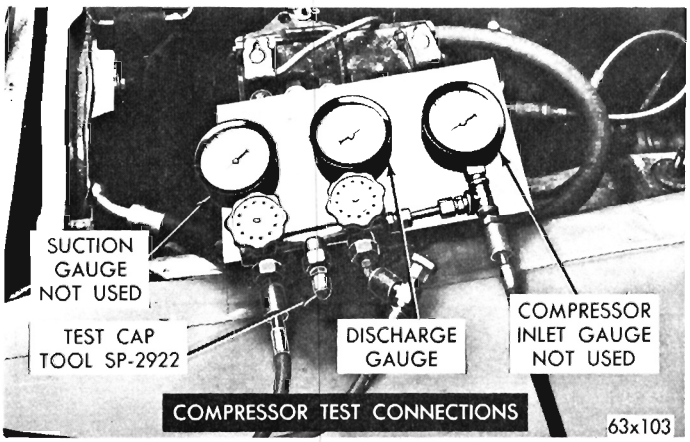


Fig. 25—Compressor Test Connections (Valiant)

If the Compressor Capacity Test (Fig. 24 and 25) is performed immediately after completing the Evaporator Pressure Regulator Valve Test, the compressor will be up to operating temperature and most of the refrigerant oil will have been returned to the compressor crankcase.

If the system has been standing any length of time, it will be necessary to perform the following operations before starting the Compressor Capacity Test:

1. Attach the gauge set manifold.

2. Start the engine and adjust speed to 1250 rpm. On **Plymouth,** turn blower switch to position No. 2, move temperature control to "Off" and push the "Cool" button.

On Valiant **Cool Aire,** push the "Hi" air conditioning blower button and move the air-conditioning control lever to the extreme right.

3. Allow the air-conditioning system to operate at full capacity for at least 15 minutes. This will cause most of the compressor oil in the system to be returned to the compressor crankcase. **It will also insure that the compressor is up to operating temperature which is very important when making this test.**

Discharging the System

When making the Compressor Capacity Test, the compressor must be disconnected from the rest of the system. That means the system must be discharged.

(1) Insert the manifold discharge hose into an exhaust ventilation system or to the outside of the building so that the service area will not be filled with refrigerant vapor.

(2) Fully open the manifold needle valve.

(3) Open the discharge (richt-hand) gauge valve a small amount. This will allow the refrigerant vapor to discharge **slowly.**

CAUTION: Do not open the valve fully and allow the system to discharge rapidly, since this would sweep some of the refrigerant oil out with the refrigerant.

(4) Allow system to discharge until discharge pressure gauge registers zero.

(5) Open the suction (left-hand) gauge valve to release any vapor trapped at the suction side.

Test Preparation and Connections

After the system is completely discharged, isolate the compressor and connect the gauge set manifold as follows:

(1) Disconnect the discharge (muffler) line from the compressor discharge adapter. Cap the discharge adapter outlet with a ½ inch cap. Seal the discharge (muffler) line.

(2) Disconnect the evaporator suction line (hose) from the suction muffler. Cap the suction muffler inlet with a ⅝ inch cap. Seal the suction line.

The compressor is now isolated from the system and sealed at both the suction and the discharge sides. Refer to Figure 24 and 25, and make the following gauge set manifold connections:

(3) On **PLYMOUTH** Disconnect the test hose and adapter from the compressor inlet port. On Valiant Cool Aire, remove the cap from the inlet port, as the test hose is not used on the compressor inlet port.

(4) Remove the valve body from the compressor inlet port. The tire valve stem, Tool C-3788 can be used for this purpose.

(5) Disconnect the test hose and adapter from the suction service port of the fitting.

(6) Install test cap (SP-2922) at the center manifold outlet.

NOTE: Be sure that the test cap is perfectly clean. Particles adhering to the cap or the metering orifice can restrict flow and cause false readings. Never use a wire or probe of any kind to clean the cap. Wash it with clean solvent and blow dry with compressed air.

(7) Make sure both the left and right gauge valves are open.

The compressor can now be operated as an air pump. Air will be drawn through the compressor inlet port, compressed and delivered (through the test hose attached to the discharge port) to the gauge set manifold. Compressor capacity is determined by noting the pressure registered at the discharge gauge when the compressor is driven at an engine speed of **exactly** 500 rpm. **THE TACHOMETER USED MUST BE ACCURATE.** Compressor capacity

test results are dependent upon controlling engine speed at exactly 500 rpm.

Test Pressures and Results

(1) Start the engine and adjust speed to exactly 500 rpm.

(2) Slowly close the left-hand gauge valve. All air delivered by the compressor will now be discharged through the metering orifice in the test cap. Pressure registered at the discharge gauge should build up to at least 190 psi (Fig. 26).

(3) The load on the compressor may affect engine speed. If necessary, readjust engine speed to **exactly** 500 rpm. The discharge pressure should build up to a minimum of 190 psi.

(4) Open the left-hand gauge valve momentarily to allow the pressure to drop. The close the valve to make sure the pressure again builds up to a minimum of 190 psi with the engine operating at 500 rpm.

CAUTION: To prevent possible compressor damage from excessive heat, do mot operate compressor more than a total of five minutes.

If the compressor does not develop a minimum of 190 psi at 500 engine rpm, both compressor valve plate assemblies and gaskets must be replaced. See Paragraph "Compressor".

After repair, the compressor capacity must be tested before charging the system and repeating the "Over-All Performance Test."

A compressor that consistently builds up to a minimum of 190 psi at exactly 500 engine rpm is delivering the rated capacity. Reconnect the evaporator suction line to the suction muffler and the discharge line to the discharge muffler. When connecting these lines use new "O" rings and lubricate both male and female connections with clean refrigerant oil. Continue with the "Expansion Valve Test."

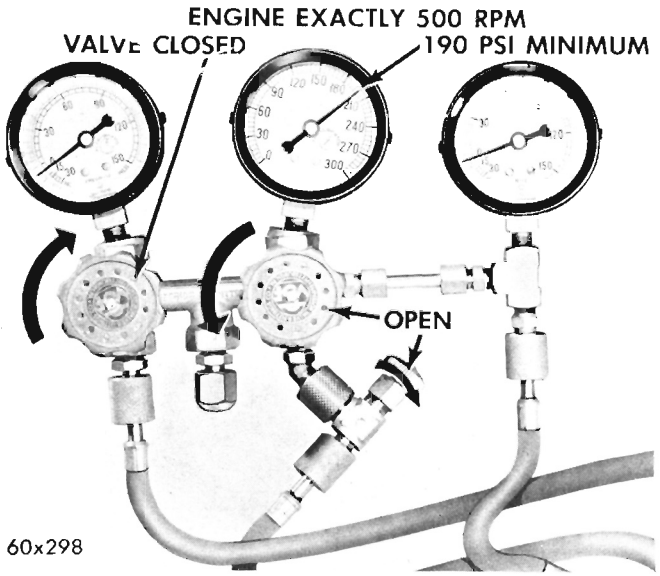


Fig. 26—Compressor Test Pressure

TEST 8

EXPANSION VALVE TEST

The following procedure permits testing the expansion valve without removing it from the system. This test is made with the system completely discharged.

IMPORTANT: It Is Absolutely Necessary For The Compressor To Pass The Compressor Capacity Test Before Testing The Expansion Valve In Its Installed Position.

A compressor which does not pass the Compressor Capacity Test may have leaking reed valves or a fractured head gasket. Such a leak would allow refrigerant gas, used in the "Expansion Valve Test," to leak from the discharge side of the compressor back into the suction side of the compressor. An internal leak between the discharge and suction side of the compressor will upset the "Expansion Valve Test" results.

Test Preparation and Connections

(1) Close both the left and right gauge set manifold valves. Open the manifold needle valve.

(2) Install a ¼" connector and a ¼" tee fitting at the left side of the gauge manifold. Install the test cap (SP-2922) on the tee fitting, and connect the test hose to the lower end of the tee fitting.

(3) Connect the other end of the suction test hose to the suction service port, using the special adapter to keep the suction service valve open.

(4) Connect the discharge test hose to the discharge service port, using a special adapter to hold this service valve open.

(5) Connect one end of the long test hose to the center of the gauge manifold, and the other end to the refrigerant dispensing manifold.

(6) Close two of the dispensing manifold valves (turn clockwise). Open the remaining dispensing manifold valve (fully counterclockwise). Remove the protective cap from the **opened** valve.

(7) Screw a refrigerant can to the **opened** manifold valve, and tighten 6 to 8 foot-pounds maximum. Tighten the manifold locking nut against the shoulder of the can, again using 6 to 8 foot-pounds maximum to insure a good seal.

(8) Turn the manifold valve (about the refrigerant can) **completely clockwise** to puncture the can. This also closes the valve and seals the refrigerant in the can.

This completes all test connections necessary for the "Expansion Valve Test." Compare the test set-up against those illustrated in Figure 27.

Then, proceed with the following preparation steps.

(9) Remove the expansion valve thermal bulb from its well inside the evaporator housing.

(10) Prepare a large pan of water heated to 125 degrees F. and place the refrigerant can upright in the water. Use enough water to provide the heat necessary to insure ample refrigerant pressure throughout this test.

(11) Prepare a container of ice and water to provide a known temperature of 32 degrees F. This will be used to test the expansion valve in its "minimum flow" position.

NOTE: Under extreme conditions of high heat and humidity the temperature of the ice and water may not be reduced to 32 degrees F. Use a thermometer to test the actual temperature. If it is necessary to lower the temperature of the ice and water, add small quantities of salt while stirring until the desired temperature of 32 degrees F. is obtained.

Maximum Flow Test— Thermal Bulb Warm

(1) Warm the thermal bulb by holding it in your hand. This will produce the same effect as a warm evaporator . . . it will open the expansion valve for maximum flow. . .

(2) Open the **refrigerant manifold valve** (fully counterclockwise) to allow the refrigerant vapor to flow to the gauge set manifold.

(3) Adjust the right-hand gauge set manifold valve to maintain **exactly** 75 psi on the discharge gauge.

(4) On all Plymouth units, the suction gauge should register 60 to 70 psi when pressure registered at the discharge gauge is maintained at exactly 75 psi. On Valiant Cool Aire units the suction gauge should register 32 to 42 psi, when pressure registered at the discharge gauge is maintained at exactly 75 psi.

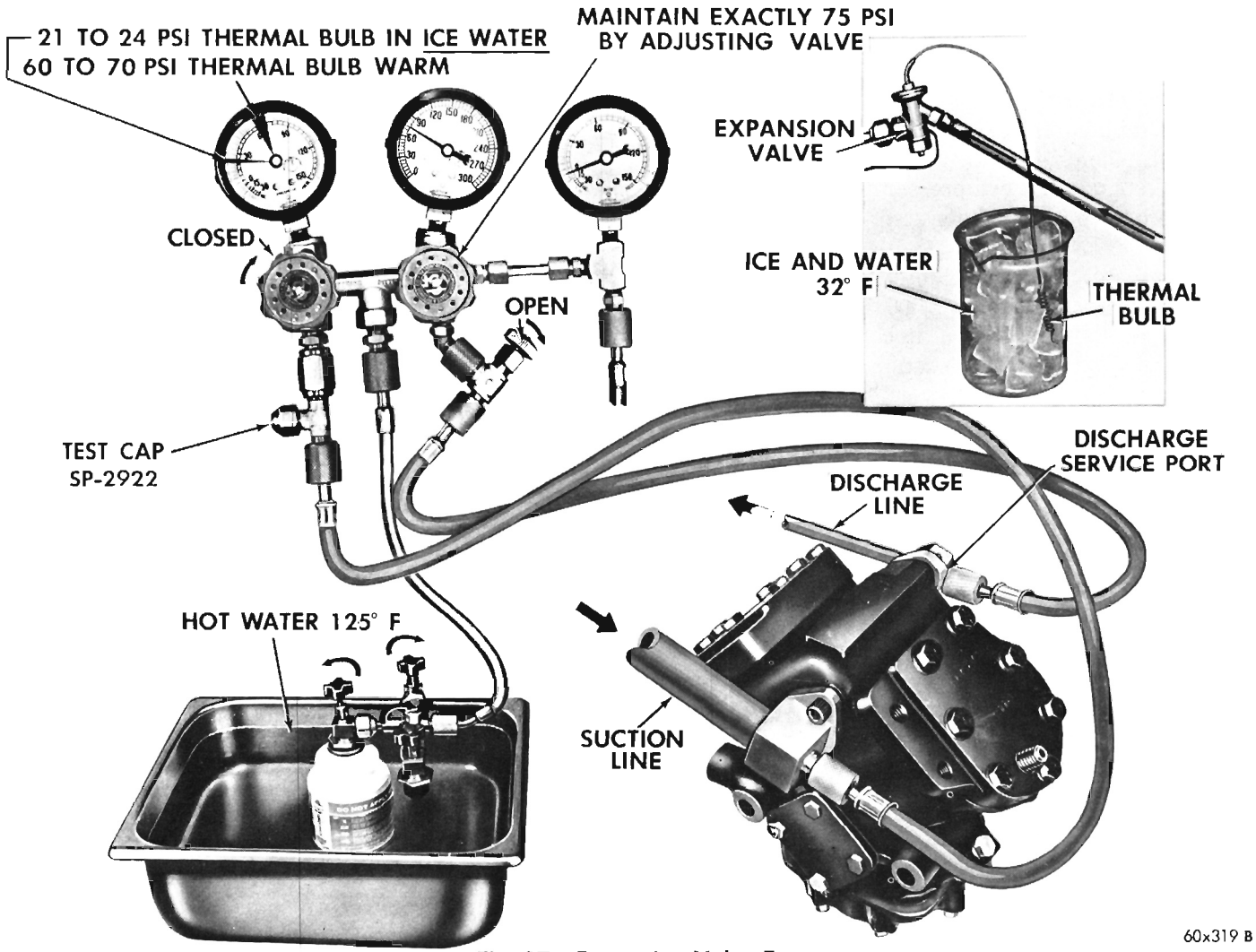


Fig. 27—Expansion Valve Test

Minimum Flow Test— Thermal Bulb at 32° F

(1) Close the right gauge valve to reduce pressure on the expansion valve. This will accelerate movement of the valve toward the "minimum flow" position.

(2) Insert the thermal bulb in the container of ice and water. Use sufficient ice to insure a water temperature of 32° F. This will cause the expansion valve to move to the "minimum flow" position.

(3) Adjust the right gauge valve to maintain **exactly** 75 psi as registered at the discharge pressure gauge.

(4) On Plymouth units the suction gauge should register 21 to 24 psi when discharge pressure is maintained at exactly 75 psi. On Valiant units the suction gauge should register 16.5 to 19.5 psi when discharge pressure is maintained at exactly 75 psi.

Test Results and Corrections

If the expansion valve does not pass these tests, it must be replaced. For detailed instructions on expansion valve replacement, refer to "Expansion Valve Replacement" in Paragraph 33.

An expansion valve which passes the above tests has the proper super heat setting, the proper pressure limit calibration, the correct rated capacity and has not lost its thermal bulb charge, therefore, it will give satisfactory performance.

Since the system is without refrigerant, it is good practice to remove the expansion valve inlet screen, clean it if necessary and reinstall it before charging the system. Clean the thermal bulb, the thermal bulb well and the brass thermal bulb wedging strips. Wedge the bulb into its well so that the brass strips force the bulb toward the suction line. The fit must be mechanically tight and all surfaces clean to insure good thermal contact.

To put the system into operation it will be necessary to sweep, test for leaks, vacuum and recharge the system.

SERVICE PROCEDURES

11. SAFETY PRECAUTIONS

The refrigerant used in all 1964 air-conditioning installations is refrigerant 12. It is transparent and colorless in both the liquid and vapor state. Since it has a boiling point of 21.7 degrees F. below zero, it will be a vapor at all normal temperatures and pressures. The vapor is heavier than air, non-flammable and nonexplosive. It is nonpoisonous except when it is in direct contact with open flame. It is noncorrosive except when combined with water. It is a safe refrigerant. The following precautions, however must be observed when handling refrigerant 12.

CAUTION: Wear safety goggles when servicing the refrigeration system.

Refrigerant 12 evaporates so rapidly at normal atmospheric pressures and temperatures that it tends to freeze anything it contacts. For this reason, extreme care must be taken to prevent any liquid refrigerant from contacting the skin and especially the eyes.

Always wear safety goggles Tool C-3355 when servicing the refrigeration part of the air-conditioning system. Keep a bottle of sterile mineral oil and a weak solution of boric acid handy when working on the refrigeration system. Should any liquid refrigerant get into the eyes, use a few drops of mineral oil to wash them out. Refrigerant 12 is rapidly absorbed by the oil. Next, wash the eyes with the weak solution of boric acid. Call your doctor immediately even though irritation has ceased after first aid treatment.

CAUTION: Do not heat refrigerant 12 above 125 degrees F.

In most instances, moderate heat is required to bring the pressure of the refrigerant in its container above the pressure of the system when charging or adding refrigerant. A bucket or large pan of hot water not over 125 degrees F. is all the heat required for this purpose. Do not heat the refrigerant container with a blow torch or any other means that would raise temperature and pressure above this temperature. Do not weld or steam clean on or near the system components or refrigerant lines.

CAUTION: Keep refrigerant 12 containers upright when charging the system.

When metering refrigerant 12 into the refrigeration system, keep the supply tank or cans in an upright position. If the refrigerant container is on its side or upside down, liquid refrigerant will enter the system and damage the compressor.

CAUTION: Always work in a well-ventilated room.

Always maintain good ventilation in the working area. Always discharge the refrigerant into the serv-

ice bay exhaust system or outside the building. Large quantities of refrigerant vapor in a small, poorly ventilated room can displace the air and cause suffocation.

Although refrigerant 12 vapor is normally non-poisonous, it can be changed into a very poisonous gas if allowed to come in contact with an open flame. Do not discharge large quantities of refrigerant in an area having an open flame. A poisonous gas is produced when using the flame-type leak detector. Avoid inhaling the fumes from the leak detector.

CAUTION: Do not allow liquid refrigerant to touch bright metal.

Refrigerant will tarnish bright metal and chrome surfaces. Avoid splashing refrigerant on any surface. Refrigerant in combination with moisture is very corrosive and can cause great damage to all metal surfaces.

12. HANDLING TUBING AND FITTINGS

Kinks in the refrigerant tubing or sharp bends in the refrigerant hose lines will greatly reduce the capacity of the entire system. High pressures are produced in the system when it is operating. Extreme care must be exercised to make sure that all connections are pressure tight. Dirt and moisture can enter the system when it is opened for repair or replacement of lines or components. The following precautions must be observed.

The system must be completely discharged before opening any fitting or connection in the refrigeration system. Open fittings with caution even after the system has been discharged. If any pressure is noticed as a fitting is loosened, allow trapped pressure to bleed off very slowly. Use a suitable tube bender Tool C-3362 when bending the refrigerant lines to avoid kinking. Never attempt to rebend formed lines to fit. Use the correct line for the installation you are servicing.

A good rule for the flexible hose lines is keep the radius of all bends at least 10 times the diameter of the hose. Sharper bends will reduce the flow of refrigerant. The flexible hose lines should be routed so that they are at least 3 inches from the exhaust manifold. It is good practice to inspect all flexible hose lines at least once a year to make sure they are in good condition and properly routed.

"O" rings and fittings must be in good condition. The slightest burr or foreign material may cause a leak. "O" rings and fittings must be coated with refrigerant oil to allow the connections to seat squarely and to be tightened evenly to the proper torque. Fittings which are not oiled with refrigerant oil are almost sure to leak (Fig. 28).

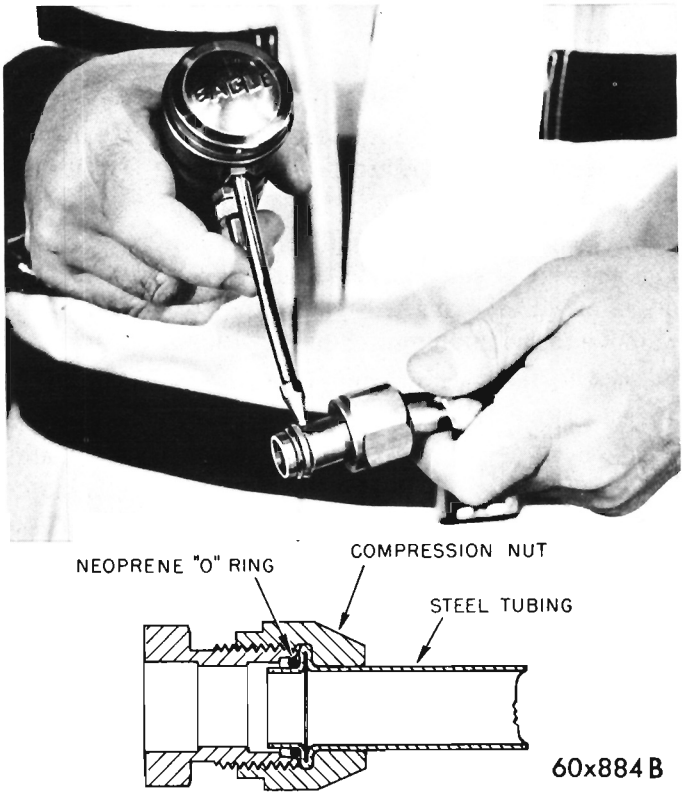


Fig. 28—Lubricate with Refrigerant Oil

The use of proper wrenches Tools C-3358 and C-3363 when making connections is very important. Improper wrenches or improper use of wrenches can damage the fittings. Always use two wrenches when loosening or tightening tube fittings to prevent distorting of lines and components.

The internal parts of the refrigeration system will remain in a state of chemical stability as long as pure-moisture-free refrigerant 12 and refrigerant oil is used. Abnormal amounts of dirt, moisture or air can upset the chemical stability and cause operational troubles or even serious damage if present in more than minute quantities.

When it is necessary to open the refrigeration system, have everything you will need to service the system ready so that the system will not be left open any longer than necessary. Cap or plug all lines and fittings as soon as they are opened to prevent the entrance of dirt and moisture. All lines and components in parts stock should be capped or sealed until they are ready to be used.

All tools, including the refrigerant dispensing manifold, the gauge set manifold and test hoses should be kept clean and dry.

The special refrigeration oil supplied for the system is as clean and dry as it is possible to make it. **Only refrigeration oil** should be used in the system or on the fittings and lines. The oil container should be kept tightly capped until it is ready for use, and then

tightly capped after use to prevent entrance of dirt and moisture. Refrigerant oil will quickly absorb any moisture with which it comes in contact.

13. COMPRESSOR DRIVE BELT ADJUSTMENT

Satisfactory performance of the air-conditioning system is dependent upon drive belt condition and tension. If the proper tensions are not maintained, belt slippage will greatly reduce air-conditioning performance and drive belt life. To avoid such adverse effects, the following service procedure should be followed:

(1) Any belt that has operated for a minimum of a half-hour is considered to be an "in use" belt. Adjust air-conditioning drive belts at the time of new-car preparation. Using the torque method, tension should be 55 foot-pounds for models equipped with 318 cubic-inch engine; 40 foot-pounds for all other V-8 engines: 25 foot-pounds for 6 cylinder engine.

(2) Measure the drive belt tension at regular service intervals, using the torque method, and readjust as needed.

(3) On all new-belt installations, new-belt tension specifications should be used when the belt is first installed to obtain proper tension. Thereafter, these replacement belts should be serviced according to the above procedure. Always replace belts in pairs if so equipped, otherwise the old belt will have insufficient tension and the load will be primarily on the new belt. Proper tension for new belts is 75 foot-pounds for 318 cubic-inch engine; 60 foot-pounds for all other V-8 engines; 35 foot-pounds for 6 cylinder engines.

14. ANTIFREEZE RECOMMENDATIONS— (Plymouth)

The Air-Conditioning System requires the engine's cooling system to be protected to +15° F. with a permanent type antifreeze for summer operation. This is to prevent freezing of the coolant in the heater core.

In the springtime, after the winter's operation with the cooling system protected with permanent-type antifreeze for the temperatures of the area, it is suggested the system be drained and flushed out with water. When draining, flushing and refilling, have the temperature control lever in the extreme hot position so the heater core is drained, flushed and refilled. Install a gallon of permanent type antifreeze in the system, and add enough water to fill the system.

Do not re-use the old antifreeze. The permanent type antifreeze does not lose its antifreeze qualitites during the winter season operation, but the chemical inhibitors for rust and corrosion prevention are weakened and finally exhausted by extended use. Do not add new inhibitor to used antifreeze in hope of revitalizing the used antifreeze.

The chemical inhibitors come in various chemical compositions, some are compatible, some neutralize each other, and some form violent reactions to each other causing foaming and other undesirable reactions. Play it safe and use new permanent-type antifreeze.

15. RADIATOR PRESSURE CAP

It is absolutely necessary for the 1964 air-conditioned vehicle to be equipped with a 15 to 16 psi radiator cap.

A radiator pressure cap testing below these specifications will permit loss of coolant during a hard pull on a hot day, or in slow moving traffic, or when the engine is stopped after a fast run on a hot day.

Test the radiator pressure cap, using Tool C-3499 (Fig. 29). Before assembling the adapter and radiator pressure cap to the pump, dip the radiator cap and both ends of the adapter into clean water to assure a tight seal.

Hold the assembled tester in a vertical position with the radiator cap downward, as shown in Figure 32. Stroke the tester pump plunger until the gauge indicates the pressure cap is relieving pressure. It must relieve at a pressure between 15 and 16 psi. If within these specifications, reinstall on the radiator.

NOTE: These test specifications are for caps tested at average altitudes. In high altitudes, the test specifications are lowered about one (1) psi for each 2,000 feet above seal level.

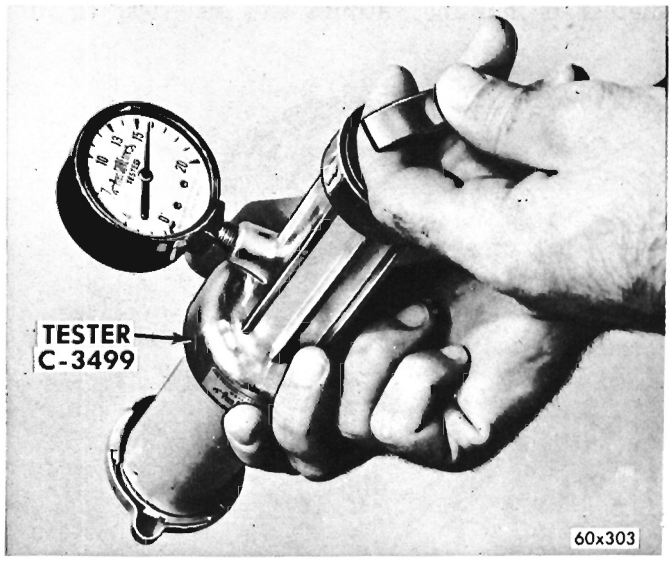


Fig. 29—Radiator Cap Tester

If the radiator cap does not test within these specifications, replace it with a cap which does.

16. VACUUM CONTROL SYSTEM, ADJUSTMENTS AND TESTS (Plymouth)

Maximum Cool Vacuum Switch Adjustment

1/16" clearance is necessary for the shaft rotation between the cam and the plunger.

The lack of clearance could break the switch lever, also too much clearance would fail to close the fresh air door and open the recirculating door in the No. 3 and 4 positions.

With the blower switch on No. 4 position, adjust the vacuum switch by placing a .060 inch spacer between the cam and the switch plunger. Move the switch toward or away from the cam. Move the switch until the plunger is fully depressed, and tighten the switch in this position and remove the spacer.

Recirculation and Fresh Air Door Linkage

To adjust the fresh air door connecting rod, remove the glove box, push "Cool" button, blower switch on No. 4 position. The recirculating door will be open, and the connecting rod is then readily accessible.

The connecting rod is provided with a turnbuckle nut and lock nut (Fig. 30). The fresh air door should be adjusted to completely closed.

Turn the blower switch to No. 1 or 2 position and inspect to see that the recirculating door is fully closed. Replace the glove box.

Vacuum Control System Test

The test of the push-button operation determines whether or not the vacuum and electrical circuits

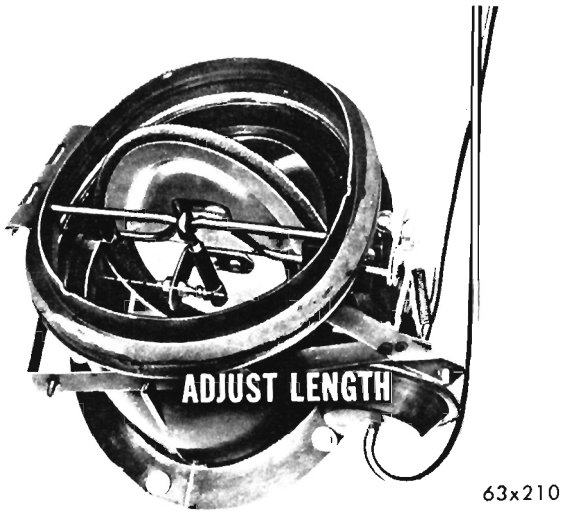


Fig. 30—Recirculation and Fresh Air Door Linkage

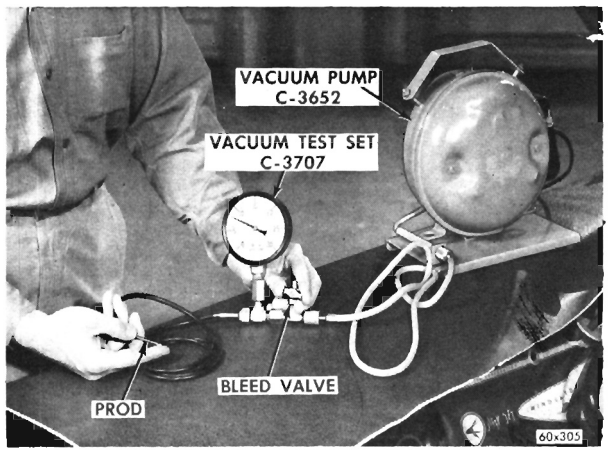


Fig. 31—Adjust Vacuum Test Bleed Valve

are properly connected and the controls are functioning properly. However, it is possible that a vacuum control system that operates perfectly at the high vacuum provided at engine idle speed may not function properly at high engine speeds. Before starting this test, stop the engine. Make certain that the vacuum source hose at the engine intake manifold is tight on its connector.

Start the vacuum pump Tool C-3652 and connect to the vacuum test set Tool C-3707. Adjust the bleed valve on the test set to obtain exactly 8 inches of vacuum, with a finger blocking the prod on the end of the test hose (Fig. 31).

It is absolutely essential that the bleed valve be adjusted so the vacuum gauge pointer will return to exactly 8 inches when the prod is covered by a finger. Otherwise a false reading will be obtained when the control circuit is tested.

CAUTION: Alternately release and reblock the hose prod several times. Make sure the bleed valve is adjusted so the vacuum gauge pointer returns to exactly 8 inches of vacuum when the prod is covered with a finger.

Disconnect the engine vacuum source hose at the "T" connector under the instrument panel, and insert the vacuum tester hose prod into the source hose leading to the control switch.

Start the test by pushing the "Heat" button. The vacuum tester gauge needle will drop until the actuator has operated, and then will return to 8 inches. Continue to push button "Defrost", "Cool", and "Off" allowing time for actuators to operate after each button is pushed, and note the vacuum drop below 8 inches after each operation. The maximum allowable vacuum drop below 8 inches after each operation is 3/4 inch.

If the vacuum drop is more than 3/4 inch, first recheck the tester for reading exactly 8 inches. If

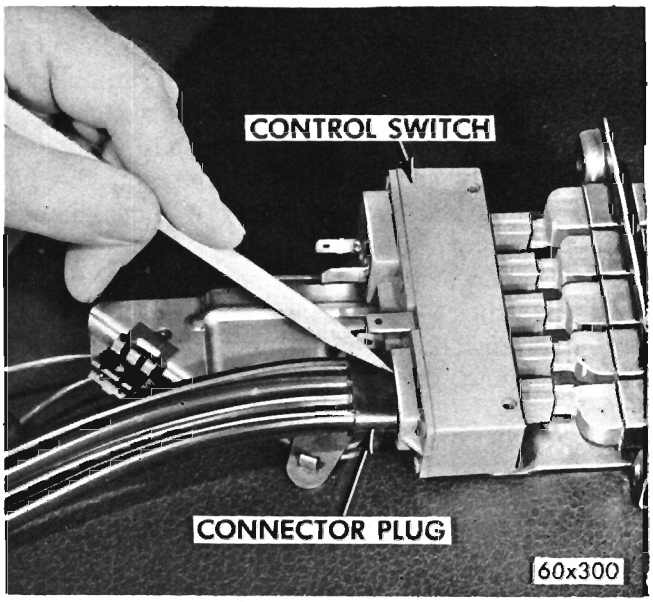


Fig. 32—Connector Plug Installed (Typical)

correct, inspect the fit of the 7-hole connector plug on the control switch (Fig. 32). This plug must be positioned all the way on the 7 prods on the control switch.

CAUTION: Do not use lubricant on the switch prods or in the holes in the plug, as lubricants will ruin the vacuum valve in the switch. If it is impossible to properly position the connector plug all the way on the switch prods, put a drop or two of clean water in the holes of the connector plug. This will allow the plug to slide completely on switch prods.

Retest: If vacuum drop is now within limits, proceed with TEST 1, "Test System Pressure". If vacuum drop is still in excess of ¾ inch, remove connector plug from switch. Insert the vacuum test prod alternately in each of the connector holes except the source hose connector hole (Fig. 33). Note the amount of vacuum drop below 8 inches after each actuator has operated. If vacuum test gauge comes back to 8 inches at each of the 6 holes, the hoses and actuators are not leaking. The control switch is faulty and must be replaced. If excessive vacuum drop shows up at one or more holes in the connector plug, isolate the faulty hose or actuator.

If the vacuum drop occurs at number 2 or 4 holes first inspect connector plug fit to Maximum Cool Vacuum switch prods (switch located on Blower Control). If vacuum drop is now within limits, proceed with TEST 1 "Test System Pressure". If vacuum drop is still in excess of ¾ inch, remove the connector plug from the switch. Insert the vacuum test prod alternately in each of the connector holes (Fig. 34). Number 8 and 9 hoses operate the fresh air door actuator. Test whether the actuator or hose is at fault; use the test hose on the actuator involved (Fig. 35).

A leak in a hose may be detected with the leak tester by running the fingers along the hose and watching the vacuum gauge reading. A faulty spot may be cut out and hose spliced, using ⅛ inch 00 copper tubing.

A vacuum drop in excess of ¾ inch below the 8 inches needed in this test would not interfere with

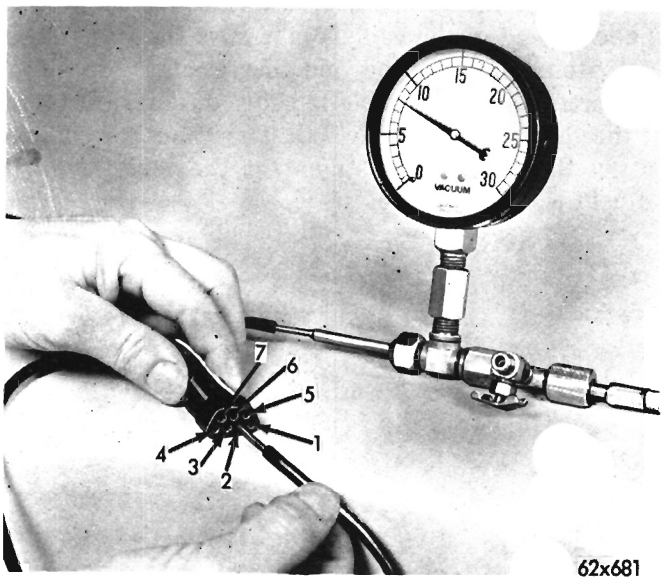


Fig. 33—Vacuum Tube Assembly Test

1. Spot cool door actuator open
2. To maximum cool vacuum switch
3. Spot cool door actuator closed
4. To maximum cool vacuum switch
5. Defroster door actuator open
6. Vacuum source
7. Defroster door actuator closed

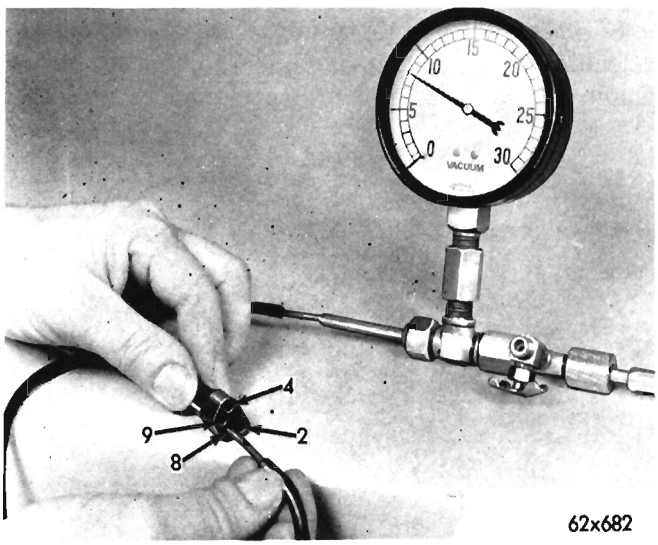


Fig. 34—Maximum Cool Vacuum Connector Test

2. To maximum cool vacuum switch
4. To maximum cool vacuum switch
8. Fresh air door actuator open
9. Fresh air door actuator closed

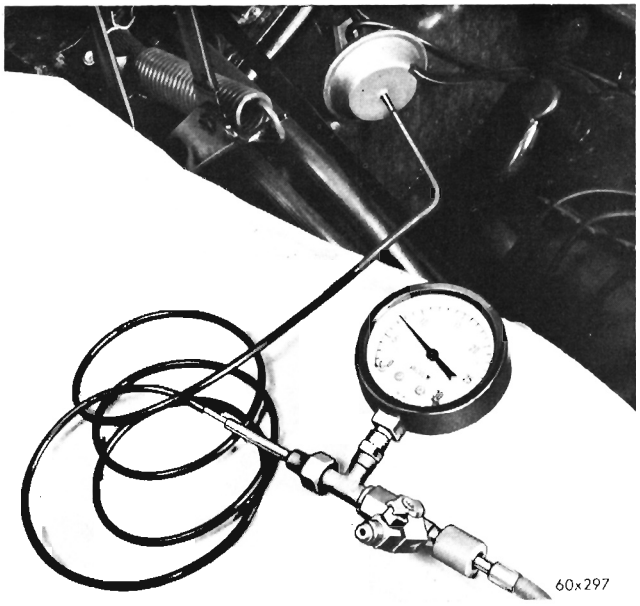


Fig. 35—Vacuum Actuator Test (Typical)

the engine operation, other than perhaps to cause a rough idle. It could, however, interfere with the proper operation of the air-conditioning and heating controls at high speeds and during acceleration.

17. A/C & HEATER TEMPERATURE SELECTOR SWITCH TEST

To test the Air Conditioning and Heater Temperature Selector Switch, disconnect the small yellow stripe and green stripe hoses on the outlet side of the two temperature thermostats. Tie these together through a tee, and connect to vacuum test set Tool C-3707. Disconnect the vacuum hose at the water valve and seal the vacuum hose end (Fig. 36).

Push and release the plunger on the temperature selector switch a few times while watching the vacuum gauge Fig. 37). A drop of more than one-half inch in vacuum indicates excessive leakage, either in the vacuum lines and connections, or in the switch itself. A vacuum hose leak may be located by running your fingers along the suspected area while watching the vacuum gauge. If the hose is otherwise in good condition, the faulty spot can be cut out and the hose spliced, using a short length of $\frac{3}{16}$-inch-diameter thin-walled copper tubing.

If inspection of the vacuum hoses doesn't uncover the leak, replace the temperature selector switch. Before you install the replacement switch, it's a good idea to connect the vacuum hoses to it and repeat the test.

A/C & Heater Temperature Selector Switch Adjustment

(1) The switch is operated by the heat door when the "cool" button is depressed. The turnbuckle should be adjusted so that the rubber edge of the heater door seals along its full length with minimum deformation. The heater door will be open ⅛ inch in the defrost position.

(2) After step 1 depress the heater button. Adjust the vacuum switch by placing a .060" inch spacer between the switch plunger and the depression lever. Move the switch until the plunger is fully depressed, and tighten the switch in this position and remove the spacer (Refer to Fig. 12).

18. A/C & HEATER TEMPERATURE CONTROL CABLE ADJUSTMENT

To adjust the temperature control cable do so at the lever end of the cable. Make sure the cable housing extends $\frac{5}{32}$ inch beyond the retainer clip at the stat assembly. If the cable is badly out of adjustment at the thermostatic valve end, it may not be possible to get the proper adjustment at the lever end. To adjust the control cable:

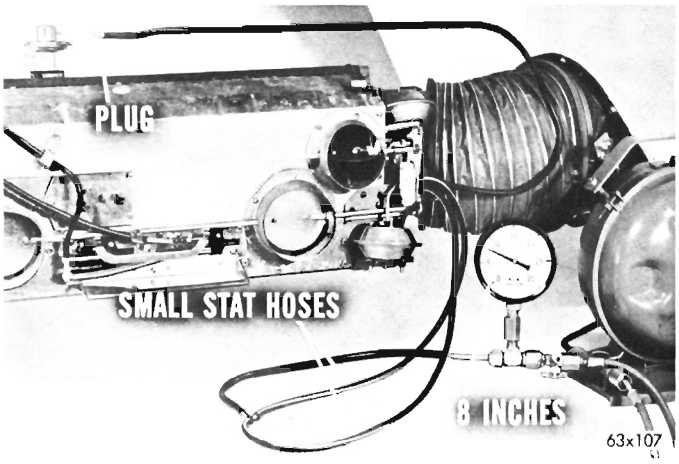


Fig. 36—Temperature Selector Switch Test

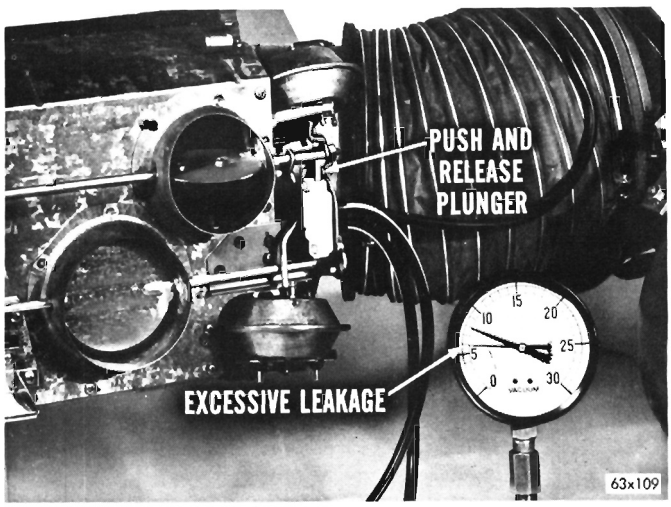


Fig. 37—Testing Switch

1. Remove the retainer clip and cable at the control lever end.
2. Pull out on the control cable wire to move the thermostat valves to the full off or closed position.
3. Hold the temperature control lever in the "Off" position, install control cable wire eyelet on the lever arm.
4. Install the retainer clip to hold the adjustment.

19. THERMOSTATIC VALVE TESTS

A complaint of erratic heat output, or no heat at all, could be traced to a faulty thermostatic valve. Before you perform the following tests, always inspect first for pinched or leaking vacuum hoses and test the temperature selector switch to be sure it isn't leaking. Also make sure the vacuum line fitting at the top of the water flow valve isn't leaking.

Test preparations. Turn the ignition switch to the "Accessory" position, turn the blower switch to the number two position and push the "Cool" button. The blower should be kept running for the entire test. Place a thermometer in the upper grille outlet so you'll know when the temperature is stabilized. Don't begin the test until the air temperature remains constant within one degree per minute. While you're waiting for the temperature to level out, remove the radio speaker grille and the speaker to make it easier to get at the thermostatic valves. Then remove the small-diameter vacuum hoses from the right-hand side of the two thermostats.

Also, disconnect the vacuum source hose for the air-conditioning unit from the intake manifold. Connect the hose to vacuum pump Tool C-3652 and start the pump. A vacuum of at least twenty inches is required for this test.

In addition, you'll need the Tool C-3707 vacuum gauge test set with a special test hose attached. The dimensions of this test hose are very important; it must be exactly forty-eight inches long and have an inside diameter of three-sixteenths inch. The specifications for this test have been calibrated for this specific hose, so don't try to substitute another size!

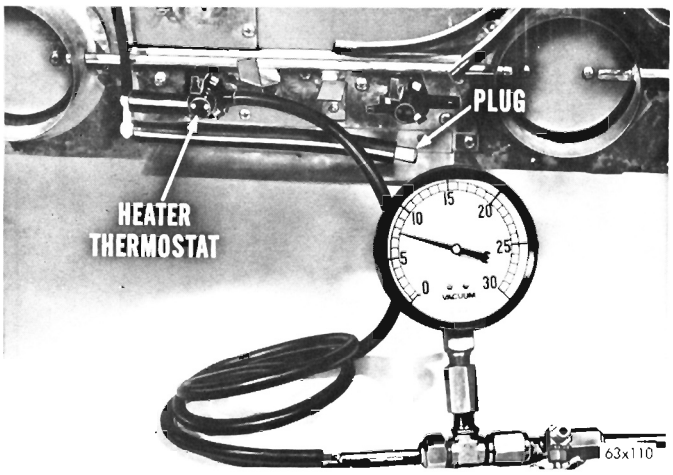


Fig. 38—Heater Thermostatic Valve Test



Fig. 39—Thermostat Mid-Position

20. HEATER THERMOSTATIC VALVE TEST (Fig. 38)

To test the heater thermostatic valve - left - hand thermostat - connect the test hose from the vacuum gauge test set to the outlet side of the heater thermostat. The heater thermostat and its inlet and outlet hoses are identified by yellow color coding: a yellow stripe on the hoses and two yellow dots of paint on the body of the thermostat. Also remove the large diameter vacuum source hose from the other thermostat and plug the end of it to prevent any air from entering. This hose has a green stripe.

Thermostat mid-position setting. Put the temperature selector lever in the "Off" position, then move it slowly toward the center of its slot. Stop when the vertical line on the cam lever arm is aligned with the raised vertical line on the end of the valve body (Fig. 39). If you over-shoot the mark, don't move the lever directly back to the proper setting. Instead, move the temperature selector lever back to the "Off" position and start over. The test which follows is based on having the thermostat cam precisely in its mid-position point.

Calibration test. When the heater stat is set precisely on the mid-position and the air temperature at the upper grille outlet is stabilized, read the thermometer and vacuum gauge. For any given temperature, the vacuum should be within the limits shown on the following chart.

HEATER THERMOSTAT MID-POSITION VACUUM CALIBRATION CHART

Degrees Fahrenheit	Vacuum Range
65	7.75-9.50
65	7.75-9.50
66	7.75-9.50
67	7.50-9.50
68	7.50-9.50
69	7.50-9.25
70	7.50-9.25
71	7.25-9.00
72	7.25-9.00
73	7.25-9.00
74	7.00-9.00
75	7.00-8.75
76	7.00-8.75
77	6.75-8.50
78	6.75-8.50
79	6.75-8.50
80	6.50-8.50
81	6.50-8.25
82	6.50-8.25
83	6.25-8.00
84	6.25-8.00
85	6.25-8.00

AIR CONDITIONING THERMOSTAT MID-POSITION VACUUM CALIBRATION CHART

Degrees Fahrenheit	Vacuum Range
65	5.25-7.00
66	5.25-7.00
67	5.00-7.00
68	5.00-7.00
69	5.00-6.75
70	5.00-6.75
71	4.75-6.50
72	4.75-6.50
73	4.75-6.50
74	4.50-6.50
75	4.50-6.25
76	4.50-6.25
77	4.25-6.00
78	4.25-6.00
79	4.25-6.00
80	4.00-6.00
81	4.00-5.75
82	4.00-5.75
83	4.00-5.75
84	3.75-5.50
85	3.75-5.50

Check valve test. To be sure that the vacuum check valve in the thermostatic valve assembly is working correctly, disconnect the source hose from the vacuum pump. This will release all vacuum in the vacuum source lines up-stream from the valve. If the vacuum gauge reading drops less than one inch in one minute, the check valve is satisfactory.

21. AIR-CONDITIONING THERMOSTATIC VALVE TEST (Fig. 40)

The air-conditioning thermostatic valve is the right-hand valve. The valve and its hoses are identified by green color coding — green stripes on the hoses and two green paint dots on the valve itself. To test this valve, attach the test hose from the vacuum gauge to the outlet fitting at the right-hand side of the valve. Disconnect the vacuum source hose from the heater stat and plug the hose. Connect the large-diameter vacuum source hose with the green stripe to the air-conditioning thermostatic valve.

Repeat the thermostat mid-position setting and then read the thermometer and vacuum gauge again. Refer to the following chart for vacuum limits for the air-conditioning thermostat calibration test. Then test the vacuum check valve as described for the heater stat.

22. THERMOSTATIC VALVE REPLACEMENT

The two thermostatic valves are serviced only as an assembly, complete with the mounting plate. So if either stat doesn't test out akay, replace the assembly. Don't attempt to adjust or replace individual stats.

Remember to disconnect the battery and remove the fuse block before you remove the stats. To remove the assembly, remove only the six screws around the perimeter of the mounting plate; never disturb the four screws that hold the individual thermostatic valves to the mounting plate. Tightening or loosening them, even very slightly, may upset the calibration of the stat. To remove or install the assembly, roll it

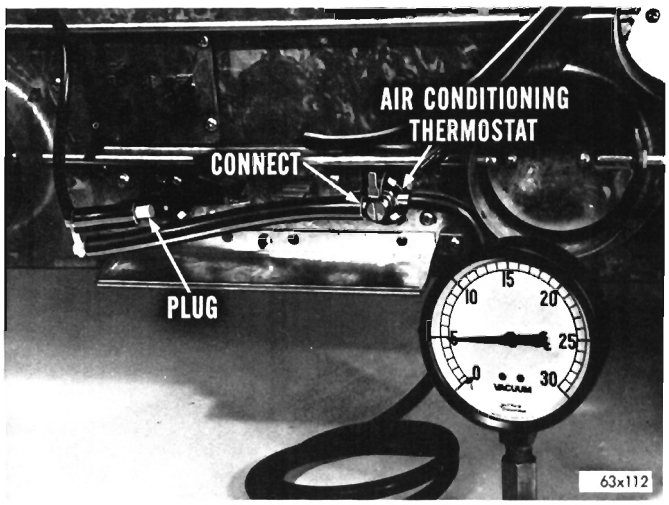


Fig. 40—Air-Conditioning Thermostatic Valve Test

in or out of the evaporator housing from the bottom of the mounting plate. This will avoid damage to the thermostatic springs and cam followers.

When you're handling the assembly, be careful not to damage the bimetal thermostatic springs in any way. Avoid touching the springs since contamination could cause corrosion and affect calibration. After the replacement assembly is installed, don't forget to remove the strip of tape that was placed on the link connecting the two cam levers to keep it from moving during shipping. When you attach the vacuum source hoses to the stats, be sure the temperature control cable is routed between the hose and the evaporator housing. If it's the other way around, with the cable over the hose, there's a good chance that the hose will be pinched, affecting the temperature control system. After the stats are installed, remember to adjust the temperature control cable as described earlier.

23. MAGNETIC CLUTCH

The magnetic clutch (Fig. 41) uses a stationary electromagnet attached to the compressor. Since the electromagnet does not rotate, the collector rings and the brushes are eliminated.

Testing Electromagnet Current Draw

To test the coil for a short or open circuit, connect an ammeter (0-10 ampere scale) in series with a fully charged 12-volt battery and the field coil lead. The current draw should be 2.5 to 2.9 amperes at 12 volts.

Removal

(1) Loosen and remove the belts. Disconnect the field coil lead wire.

(2) Remove the special locking bolt and the washer from the compressor crankshaft at the front center of the clutch.

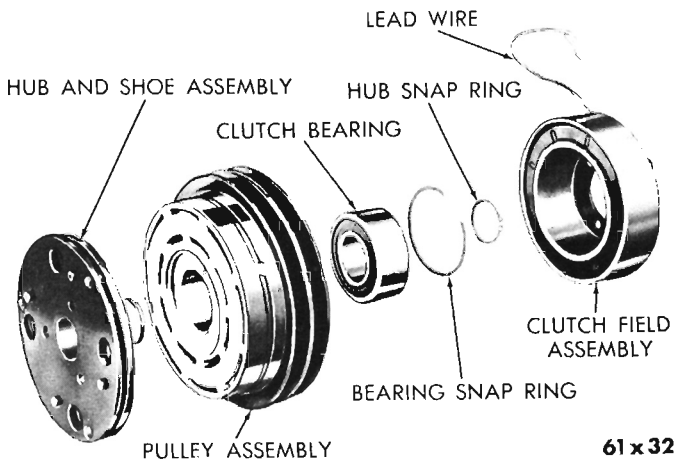


Fig. 41—Magnetic Clutch—Stationary Field Type (Typical)

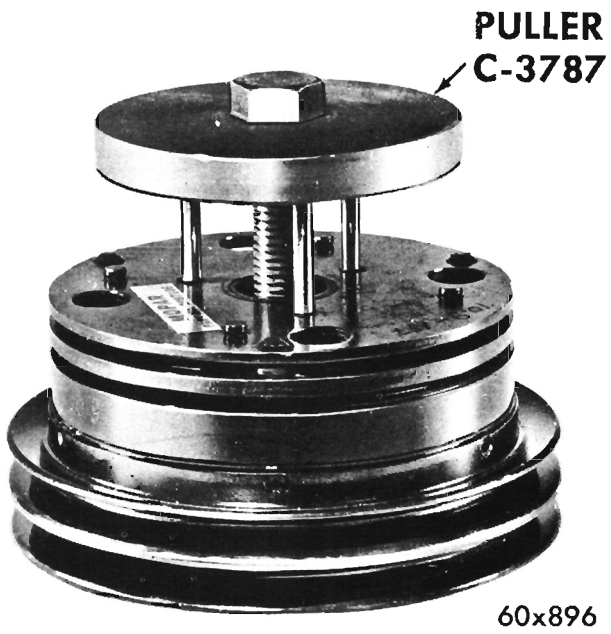


Fig. 42—Removing the Hub and Shoe Assembly (Typical)

(3) Insert a cap screw into the threaded portion of the hub and shoe assembly.

(4) Support the clutch with one hand, then tighten the cap screw until the clutch is removed.

(5) Remove the three hex field coil assembly mounting screws and lift off the assembly.

Disassembly

(1) Remove the small snap ring from the drive hub with Tool C-3128 or equivalent.

(2) Install the drive hub puller Tool C-3787 aligning the three pins of the tool in the three holes in the hub and shoe assembly. Tighten the hex head bolt down until the drive hub is removed from the bearing (Fig. 42).

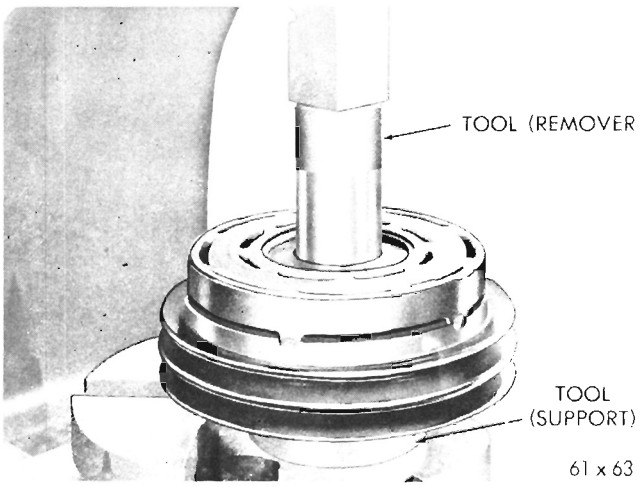


Fig. 43—Removing the Bearing from the Pulley Assembly

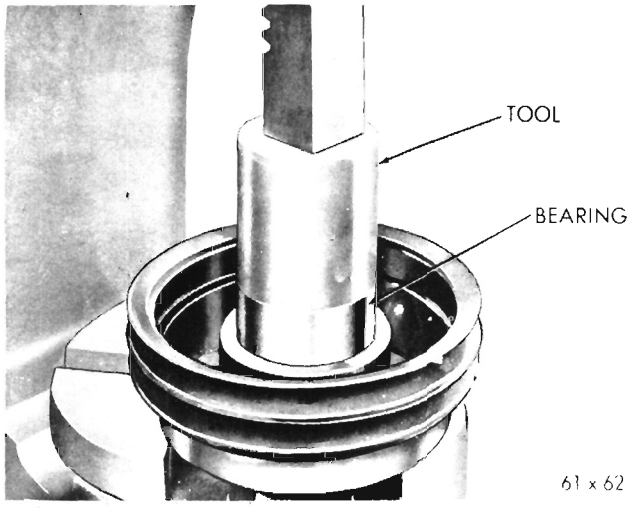


Fig. 44—Installing a New Bearing in the Pulley Assembly

(3) Remove the bearing snap ring from the pulley assembly.

(4) Place the pulley assembly on an arbor press, with the pulley side down, and the bearing hub centered on Tool C-3835. Install the Tool SP-3496 on the inner race of the bearing and press the bearing from the pulley assembly (Fig. 43).

NOTE: A new bearing must be installed every time the magnetic clutch is disassembled.

Assembly

(1) Install the pulley assembly with the pulley side up on an arbor press and insert a **new** bearing into the bore. Install the Tool C-3807 against the bearing and press into position (Fig. 44).

(2) Install the pulley assembly with pulley side facing down on Tool C-3807.

(3) Start the drive hub into the inner bearing race, and press the hub into position with an arbor press.

(4) Install the bearing snap ring and the hub snap ring.

CAUTION: The pulley assembly and hub assembly are mated parts. They are burnished at the factory before shipment. No attempt should be made to replace either unit separately as this may reduce the initial torque of the clutch.

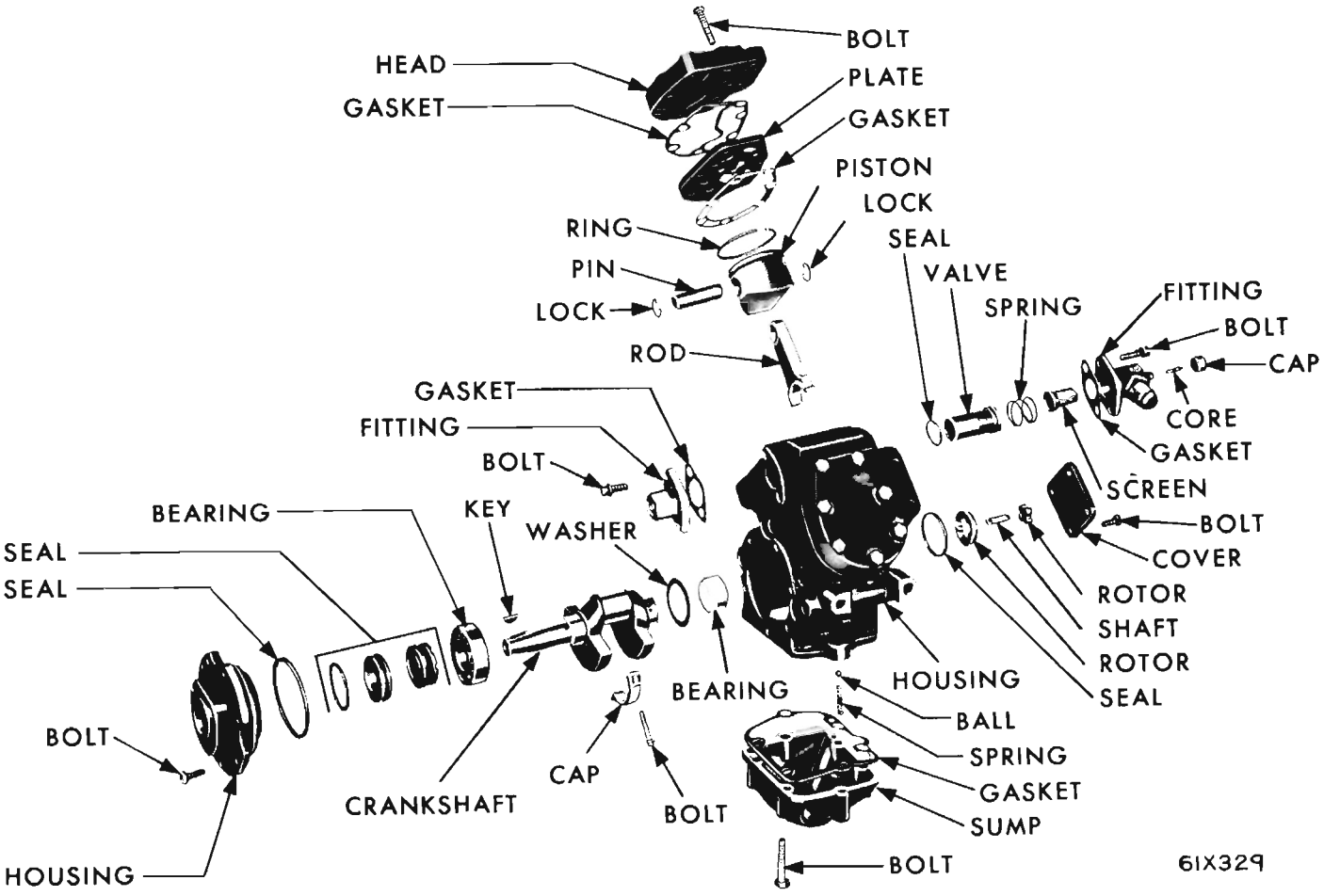


Fig. 45—Compressor (Disassembled View) (Typical)

Installation

(1) Install the field assembly on the base of the compressor bearing housing. Make sure the coil assembly is positioned so that the lead wire points up and can be routed between the compressor cylinder head. Install the three mounting screws and tighten to 17 inch-pounds torque.

(2) Insert the woodruff key in the crankshaft.

(3) Install the clutch assembly onto the crankshaft.

(4) Install the washer and a **new** self-locking bolt, and tighten to 20 foot-pounds torque.

(5) Connect the field lead wire.

(6) Install the belts, tighten to the specified tension.

24. COMPRESSOR

The compressor is a two-cylinder, reciprocating-type designed specifically for the Chrysler Air-Conditioning System. Service parts are available so that the compressor can be repaired in the field.

Fig. 45 is a disassembled view of the compressor with the nomenclature of the parts. Some parts are serviced individually and some are serviced in packages which include two or more service parts. Refer to the parts book for this information.

CAUTION: The refrigerant oil used in the compressor is carried through the entire system by the refrigerant. Some of this oil will be trapped and retained in the system when the refrigerant is discharged for testing or unit replacement. If the compressor is to be removed for repair or replacement, measure the refrigerant oil level in the compressor before the compressor is removed from the vehicle so that the same oil level can be established when the new or repaired compressor is installed on the vehicle. Too much refrigerant oil in the system can cause abnormal operating pressures and reduce the performance of the entire system.

Complete disassembly and assembly of the compressor must be performed with the compressor removed from the vehicle. However, on some models the valve plate and crankshaft gas seal assemblies can be replaced with the compressor installed on the vehicle.

CAUTION: The system must be completely discharged before attempting to perform any disassembly or repair service to the compressor.

Cleanliness is extremely important. The work area must be clean and free of air-borne dust and dirt. All parts must be thoroughly cleaned and blown dry before reassembly.

Do not use air to dry the crankshaft front main bearing. Wash the bearing in **clean** mineral spirits and shake out all excess cleaning fluid. Saturate the bearing with **clean refrigerant oil** and assemble immediately. Any dirt in the front main bearing assembly will cause noisy operation and possible damage to the bearing.

CAUTION: Before reassembly of any unit, all contact surfaces must be liberally coated with clean refrigerant oil. Refrigerant oil must be kept in a sealed container until ready for use to prevent entrance of moisture and dirt. Never use engine oil as a substitute for refrigerant oil.

EPR Valve—Replacement (Except Valiant)

(1) Remove the two EPR valve suction line fitting bolts, the fitting which also contains the compressor suction screen, spring, and the gasket.

(2) Remove the "EPR" valve and "O" ring from the compressor using Tool C-3822, by rotating the valve counterclockwise slightly, as shown in Fig. 46.

(3) To install, place the "O" ring on the "EPR" valve.

(4) Lubricate the "O" ring with refrigerant oil and install the "EPR" valve in the compressor with Tool C-3822 and rotating the valve counterclockwise.

(5) Install the compressor suction screen in the "EPR" valve suction line fitting.

(6) Install the suction line fitting gasket, spring, fitting, and attaching bolts.

Compressor—Removal

(1) Discharge the system. Refer to "Discharging The System", TEST 7 in INSPECTION, TEST PROCEDURES AND DIAGNOSIS.

(2) Measure and record refrigerant oil level so that the oil level of a replacement or repaired compressor

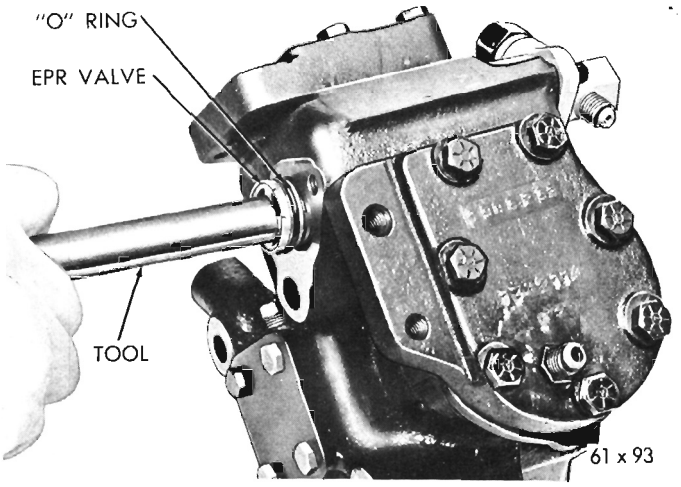


Fig. 46—Removing or Installing EPR Valve

can be adjusted to the **exact level in the compressor removed from the vehicle.**

(3) Disconnect the suction and discharge lines at the muffler fittings.

CAUTION: Plug or cap all lines as soon as they are disconnected to keep moisture out of the system.

(4) Disconnect the magnetic clutch-to-control-unit wire.

(5) Loosen and remove the compressor pulley belts.

(6) Remove the compressor-to-bracket attaching bolts, and remove the compressor.

Installation

(1) Install the compressor to bracket, and tighten the attaching bolts.

(2) Install the compressor pulley belts.

(3) Connect the magnetic clutch-to-control-unit wire.

(4) Remove the caps or plugs, connect the suction and discharge lines to the compressor.

CAUTION: When replacing the compressor assembly, the crankshaft should be rotated by hand at least two complete revolutions, to clear oil accumulation from compressor head before the clutch is energized to avoid damaging the compressor reed valves.

NOTE: After the compressor is installed, it is imperative that the oil level in the compressor be adjusted to the level registered before removing the compressor. If original oil level is not known, adjust the level to two inches if positioned at the vehicle installation angle measured through oil filler opening.

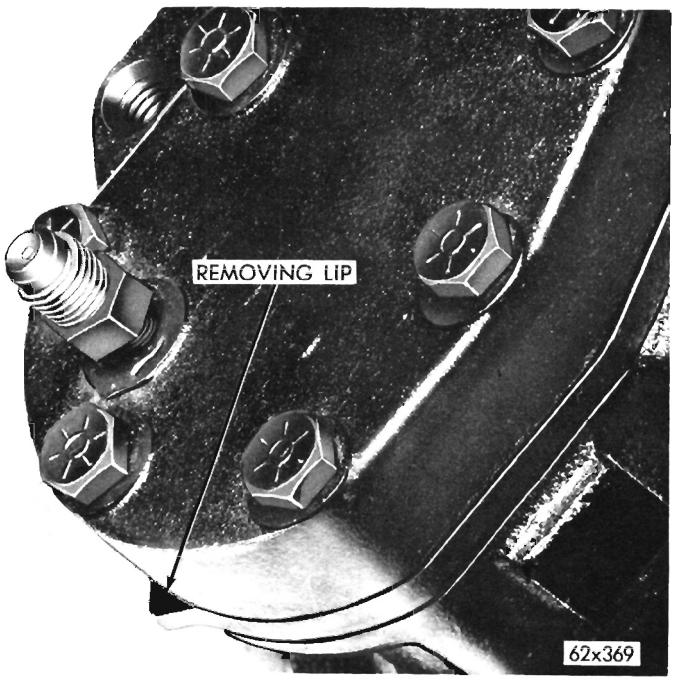


Fig. 47—Valve Plate and Head Removing Lip

Cylinder Head and Valve Plate—Removal

(1) Remove the cylinder head bolts and the head and valve plate assembly. If the plate does not separate from the head, tap the removing lip on the valve plate lightly with a plastic hammer (Fig. 47). Do not pry apart.

Inspection

After removal of the head, plate and gaskets, examine the valves. If the valves are broken and damage extends to cylinder bores, examine the bores to see if they can be repaired by removing light scoring, scuffing or scratches with crocus cloth. After conditioning the cylinder bores, clean the surfaces of the cylinder block, valve plate and head thoroughly with mineral spirits.

Use care to remove all shreds of old gasket from the plate, block and head surfaces. Clean the attaching stud holes in the block. If the valve plate or cylinder head is damaged, replace, using a complete compressor valve plate replacement package.

Installation

(1) The valve plate and cylinder head must be assembled with the reed valve assembly positioned, as shown in Figure 48.

(2) Dip gaskets in clean refrigerant oil. Using pilot studs as a guide, install valve plate gasket, valve plate, cylinder head gasket and cylinder head, as shown in Figure 49.

(3) Install attaching bolts. Tighten each bolt alternately and evenly 23 to 27 foot-pounds torque.

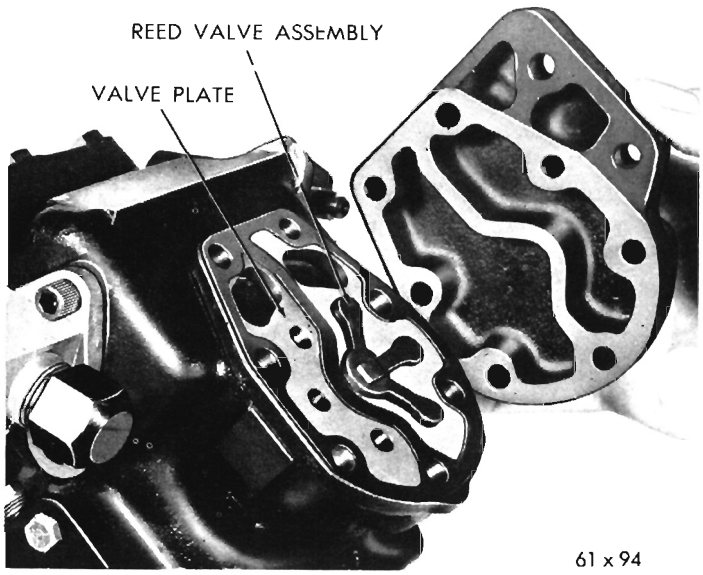


Fig. 48—Valve Plate—Installed Position

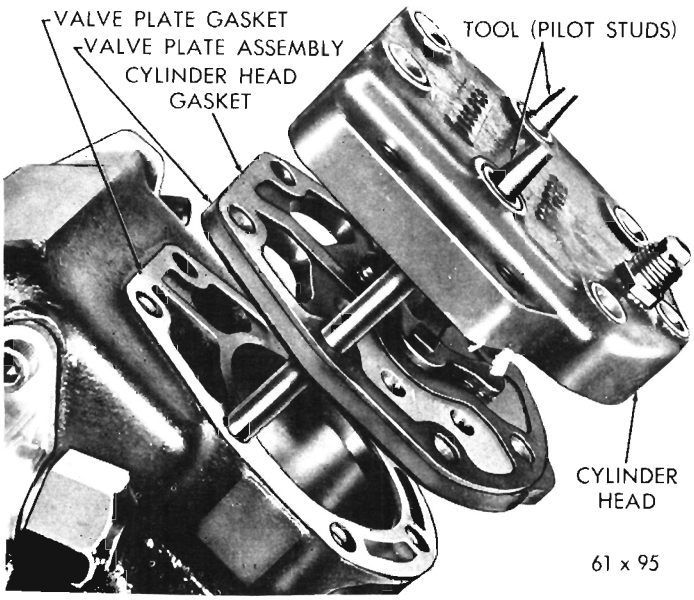


Fig. 49—Installing Valve Plate and Cylinder Head

Piston and Connecting Rod—Removal

(1) Drain the oil from the compressor.

(2) Remove the sump attaching bolts.

(3) Separate the sump from the case by tapping with a plastic hammer being careful not to distort the oil pressure relief spring.

(4) Remove the oil relief spring and (rubber) ball from the crankcase.

(5) Remove the cylinder heads and valve plates.

NOTE: Before removing the pistons, rods or rod caps, mark all parts to insure reassembly in the original position.

(6) Remove the rod caps; remove the piston and rod assembly from the cylinder.

Inspection

Inspect the piston and rings for score marks. Inspect rod bearing for pits and for chipping. Replace parts if damaged.

Installation

(1) Remove the bearing cap and install the piston in the bore. Use the piston ring compressor to prevent ring damage.

(2) Install the bearing caps, and tighten screws 52 to 56 inch-pounds torque. Be sure each cap is installed in its original position.

(3) Install the valve plates and the cylinder heads.

(4) Turn the compressor upside down. Install the pilot studs, gasket, oil pressure relief ball and spring.

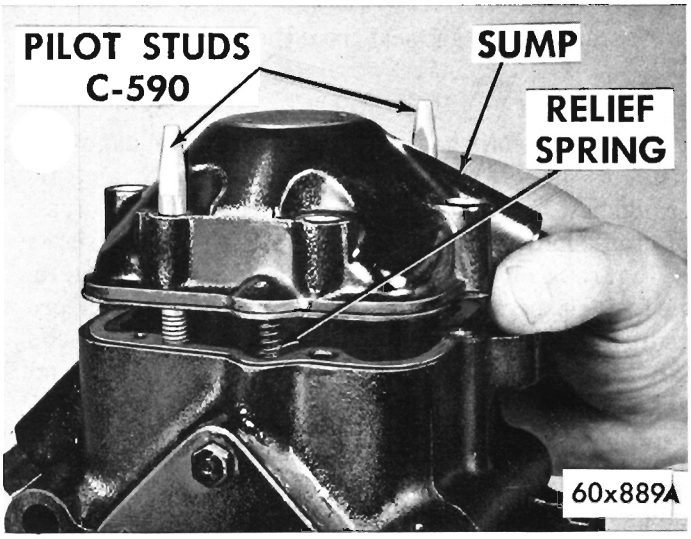


Fig. 50—Installing Sump

(5) Install the sump over the pilot studs (Fig. 50), making sure that the oil pressure relief spring depresses uniformly as the sump is lowered on the case.

(6) Tighten the sump bolts finger tight to prevent spring misalignment, then tighten 15 to 19 foot-pounds torque.

(7) Refill with new refrigerant oil after the compressor is installed on vehicle. Do not re-use the oil that was previously drained.

NOTE: If the original oil level is known, adjust level to two inches after installation.

Crankshaft Bearing Housing and Gas Seal—Removal

(1) Remove the crankshaft housing seal bolts.

(2) Remove the bearing housing from the case, using two screw drivers inserted in slots provided to pry housing from the case. Fig. 51.

(3) Remove the crankshaft bearing housing seal face plate from the bearing housing. This is part of the gas seal replacement package and must be replaced when the gas seal assembly is replaced.

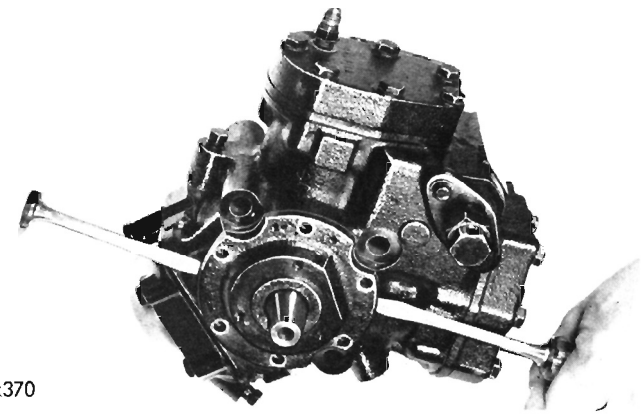


Fig. 51—Crankshaft Bearing Housing Removal

(4) Remove the gas seal from the crankshaft.

Installation

The crankshaft gas seal replacement package consists of the crankshaft gas seal assembly and the crankshaft bearing housing seal face plate. Two types of crankshaft seals are supplied for service, as shown in Figure 52. If the replacement package contains the cartridge-type seal, follow the entire installation procedure given below. If the replacement package contains the unitized-type seal, steps 1, 2 and 4 will not apply.

(1) Before installing the cartridge-type gas seal assembly, insert the assembly to make sure that the tangs index the slots of the mating part. This will insure proper spring action. The carbon seal must be assembled, as shown in Figure 52.

(2) Hold the seal firmly on the outside edge to prevent it from rotating out of the index slots.

(3) Lubricate the crankshaft with refrigerant oil. Slide the seal on the crankshaft with the smooth (carbon seal) surface up, or toward the front of the compressor.

(4) When the seal bottoms against the crankshaft bearing, test indexing of tangs again by pressing down with thumbs to see if it has the proper spring action (Fig. 53).

(5) Lubricate and install the crankshaft bearing housing seal face plate with the smooth (micro-finish) side up. Use a sleeve with the minimum inside diameter of 1⅜ inches to avoid damaging the micro-finish sealing surface of the face plate. Tap sleeve lightly until the seal face plate is fully seated in the housing.

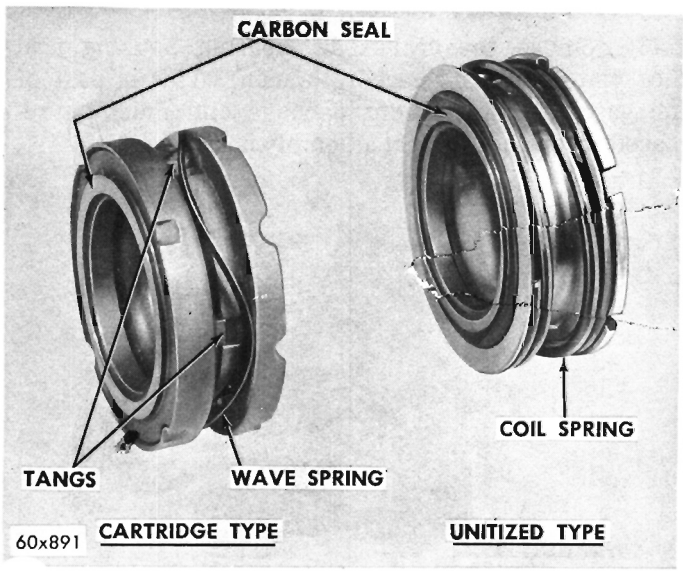


Fig. 52—Gas Seal Identification

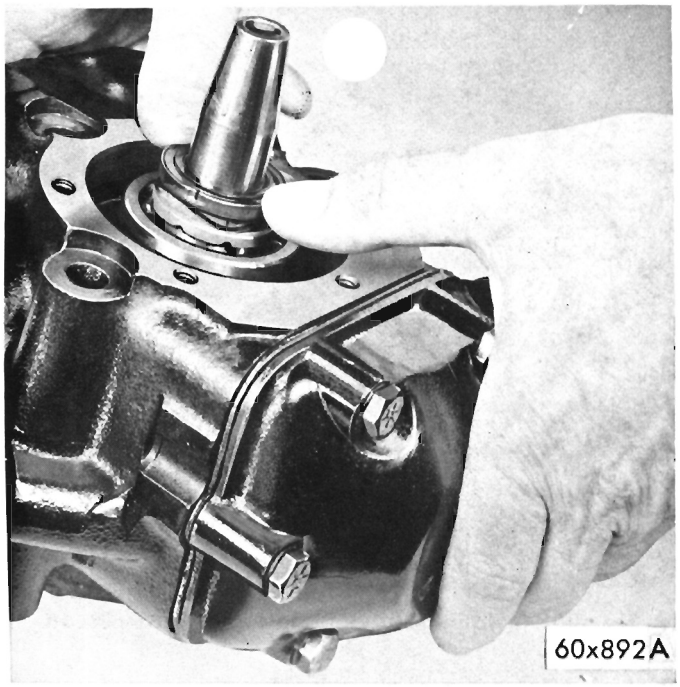


Fig. 53—Checking Indexing of Tangs

(6) Install the bearing housing oil seal, using plenty of refrigerant oil.

(7) Install the housing, making sure that it is in proper alignment with the screw holes. The gas seal assembly may be damaged if the bearing housing is rotated after the housing seal contacts the carbon seal

(8) Install bolts and tighten 10 to 13 foot-pounds torque.

Crankshaft and Ball Bearing—Removal

(1) Remove the cylinder heads and valve plates.

(2) Remove the pistons and connecting rods.

(3) Remove the crankshaft bearing housing and gas seal.

NOTE: The pistons and rods must be completely removed before the crankshaft removal.

(4) Remove the crankshaft and thrust washer from the crankcase.

(5) To remove the crankshaft ball bearing, use a small arbor press. Make sure the bearing is properly supported before pressing the bearing from the shaft.

Inspection

Clean and inspect all parts. Replace questionable parts as required. If the crankshaft ball bearing is in good condition and clean, protect it against entry of dirt and re-use it. If bearing is serviceable but dirty, or there is evidence of dirt, clean it carefully with mineral spirits and shake dry. Saturate bearing

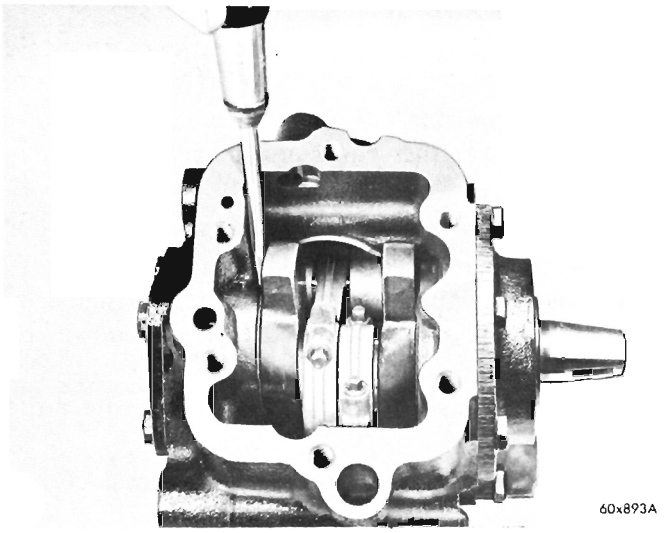


Fig. 54—Checking Crankshaft Axial Movement

with clean refrigerant oil and assemble immediately. If a new bearing is to be installed, leave it wrapped in its protective package until ready for installation.

NOTE: Do Not Wash a New Bearing Assembly Before Installation.

Installation

(1) Press the crankshaft ball bearing on the crankshaft using a sleeve which bears on the inner race only.

(2) Install the crankshaft, making sure that the thrust washer is on the rear bearing journal before placing the crankshaft in the crankcase.

(3) Rotate the crankshaft to engage the oil pump shaft in the crankshaft slot.

(4) Install the gas seal and crankshaft bearing housing. Use suitable tool, as shown in Figure 54, to assure free axial movement.

(5) Install the pistons and connecting rods.

(6) After the pistons and connecting rods are installed, turn the crankshaft to test freeness. The shaft should turn without binding.

(7) Install oil sump, valve plates and cylinder heads.

Oil Pump—Removal

It is not necessary to drain the refrigerant oil from the crankcase to remove the oil pump.

(1) Remove the oil pump cover plate and oil seal.

(2) Remove the drive shaft and rotors.

Installation

(1) Install the oil pump drive shaft by rotating the shaft until the tang end engages in the crankshaft slot.

(2) Install the inner rotor on the drive shaft, engaging the drive.

(3) Install the outer rotor, rotate it until it will slide forward over the inner rotor cams. Turn the compressor crankshaft with the oil pump in this position to determine that the rotors do not bind.

(4) Install the oil pump cover plate and oil seal.

(5) Tighten the bolts 10 to 13 foot-pounds torque.

(6) Rotate the crankshaft again to assure free operation.

25. EXPANSION VALVE, HEATER CORE AND EVAPORATOR, AND BLOWER—REPLACEMENT (Plymouth)

Expansion Valve Removal

The system must be complately discharged before opening any of the refrigerant lines.

(1) Remove the equalizer line from the evaporator suction line fitting.

(2) Disconnect the valve from the ⅜ inch inlet line and from the ½ inch outlet line. Use two wrenches to loosen each of these connections.

(3) From the evaporator engine-side housing, carefully pull the thermal bulb (Fig. 55) from the well located inside the evaporator housing.

Installation

Clean the thermal bulb well, wedging shims and thermal bulb before installing the expansion valve. The valve will not function properly unless there is a good thermal contact between the bulb and its well.

Clean parts and a tight fit of the bulb in the well will insure a good thermal contact.

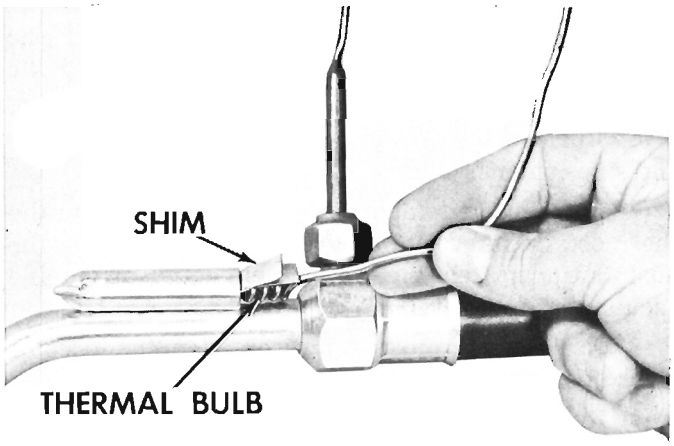


Fig. 55—Thermal Bulb Installed (Typical)

(1) Install the thermal bulb, making sure it is a tight mechanical fit in the well.

(2) Lubricate all expansion valve and line fittings with clean refrigerant oil. Install the expansion valve, using **two** wrenches to prevent rotation and twisting of the lines.

(3) Connect the equalizer tube to the fitting on the evaporator suction line.

(4) Using two wrenches, inspect all connections for tightness.

After the expansion valve is installed, it must be completely tested. Then the system must be tested for leaks and recharged.

Heater Core and Evaporator Assembly Removal from Vehicle

The heater core and evaporator are compactly packaged forward of the instrument panel and must be removed as a single unit. The system must be completely discharged before opening any of the refrigerant lines and the cooling system drained. Remove front carpet for additional clearance.

(1) Disconnect the battery and remove the air cleaner.

(2) Disconnect the equalizer line from the evaporator suction line fitting. Disconnect the ⅜ inch inlet line, ½ inch outlet line, and remove the expansion valve. Cap all the refrigerant lines to prevent the entrance of dirt and moisture.

(3) Disconnect the heater hoses, plate and seal, vacuum hose from the water valve and push through the firewall.

(4) Remove the drain tubes, two nuts and washers from the studs, and mounting bolt.

(5) Remove the sound deflector cover under the glove box, remove the glove box assembly, radio grille and speaker.

(6) Remove the blower motor flexible duct, upper and side cooler tubing.

(7) Remove the temperature control cable from the thermostat, the vacuum hose connectors from the push button switch, the blower switch and the engine vacuum hose.

(8) Remove the electrical wires from the resistor block and relay.

(9) Remove 2 mounting brackets, one top center, one upper left side.

(10) Remove the assembly with the blower motor as a single unit.

(11) Remove the blower motor mounting bracket from the mounting studs.

Heater Core Removal

(1) Remove the vacuum hoses from the thermostats and the water valve vacuum block from the switch.

(2) Loosen the side outlet actuator mounting nuts, disconnect the retainer clip from the rod and remove the actuator.

(3) Remove the linkage from the side outlet door shaft.

(4) Loosen the upper outlets mounting nuts, disconnect the retainer clip from the rod and remove the actuator.

(5) Remove the sheet metal screws and remove the cover.

(6) Remove the fillet from the lower right corner of the case.

(7) Remove the attaching metal screw and pull out the heater core being careful not to damage the heater door (Fig. 56).

Heater Core Installation

(1) Install the heater core being careful not to damage the heater door.

CAUTION: Be sure the seals on the heater core to evaporator are in place, bottom and both sides.

(2) Install the fillet in the lower right corner.

(3) Install the cover with sheet metal screw. Cover to case has to be an air tight seal.

(4) Install the upper outlet and retainer clip.

(5) Install the side outlet actuator, retainer clip and the linkage.

(6) Install the vacuum hoses to thermostats and the water valve vacuum block to the switch.

Evaporator Removal

(1) With the heater core removed from the case, remove the heater core right mounting bracket (metal screws).

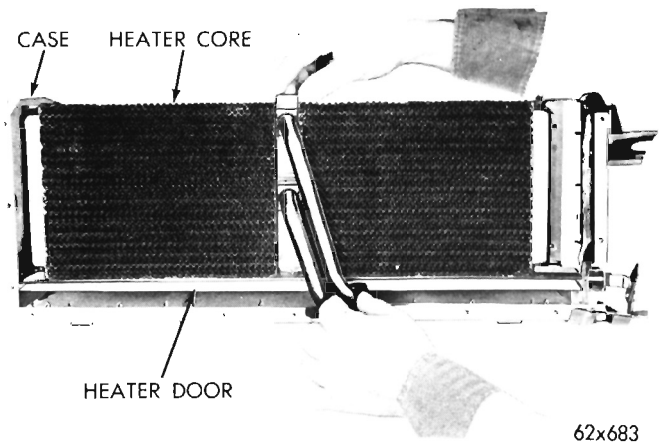


Fig. 56—Removing Heater Core

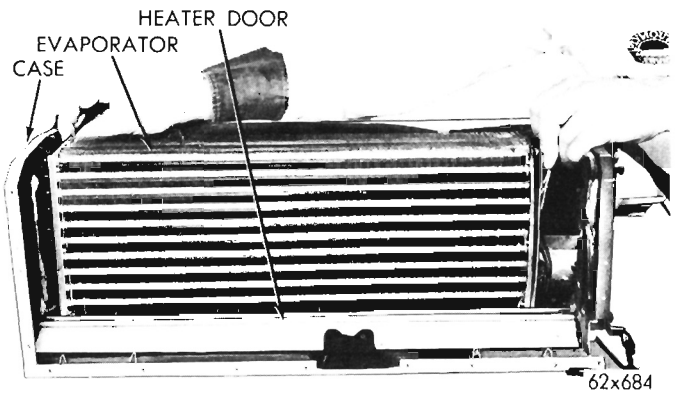


Fig. 57—Evaporator Removal

(2) Remove two nuts attaching the evaporator to the case.

(3) Remove the metal screw (upper left side) evaporator to the case.

(4) Remove the evaporator inlet, outlet retainer plate (metal screws) and the sealer.

(5) Remove the evaporator from the case (Fig. 57).

Evaporator Installation

(1) Place the sealer in the case for the evaporator sealing and position the evaporator in the case, securing with the screw, and two nuts.

(2) Install the sealer and retainer plate, secure with metal screws.

(3) Install the heater core right mounting bracket in the case (metal screws).

Installation in the Vehicle

(1) Install the blower motor to the mounting bracket.

(2) Install the assembly with the blower motor beneath the instrument panel, securing the mounting brackets (upper left side and top center of case).

NOTE: Be sure the motor ground wire is attached to the top center bracket.

(3) Install the mounting bolt and nuts to studs through the firewall.

(4) Install the electrical wires to the resistor block and relay.

(5) Install the temperature control cable thermostat, vacuum hose connectors to the push button switch, blower switch and the engine vacuum hose.

(6) Install the upper, side cooler tubing, blower motor flexible duct.

(7) Install the radio speaker, grille, glove box assembly, and sound deflector.

(8) Install the drain tubes, seal with plate for heater tube opening, heater hoses, vacuum hose to the water valve.

(9) Use new "O" rings with clean refrigerant oil on all connections then install expansion valve, equalizer line, inlet line, outlet line and suction line.

(10) Connect the battery cable and install the air cleaner.

After the evaporator assembly is installed in the vehicle it will be necessary to sweep the system, test for leaks and charge the system with the proper amount of refrigerant. It is recommended that the operation of all controls be tested and an overall performance test be made after repair or replacement of the evaporator assembly.

Blower—Removal

(1) Disconnect the battery ground cable.

(2) Remove the radio grille and speaker to disconnect the motor "hot" wire from the resistor block, the ground wire from the case mounting bracket.

(3) Remove the sound deflector cover under the glove box.

(4) Remove the glove box assembly, blower motor duct (rubber).

(5) Remove the blower motor.

Installation

(1) Install the wires into the case and out through the wire opening before positioning the blower motor.

CAUTION: Make certain the grommet is installed properly.

(2) Install the blower motor duct, and the glove box assembly.

(3) Connect the motor "hot" wire to the resistor block, ground wire to case mounting bracket.

(4) Install the radio speaker, grille, and the sound deflector.

(5) Connect the battery ground cable.

(6) Test the operation of blower motor.

26. EXPANSION VALVE, EVAPORATOR AND BLOWER—REPLACEMENT (Valiant)

Removal—Expansion Valve

The system must be completely discharged before opening any of the refrigerant lines.

(1) Remove the equalizer tube from the evaporator suction line.

(2) Carefully pull the thermal bulb and thermal bulb wedging shims from the well located on the evaporator suction line.

(3) Disconnect the valve from the inlet and outlet lines. Use two wrenches to loosen each of these connections.

Installation

Clean the thermal bulb well, wedging shims and thermal bulb before installing the expansion valve. The valve will not function properly unless there is a good thermal contact between the bulb and its well.

Clean parts and a tight fit of the bulb in the well will insure good thermal contact.

(1) Install the thermal bulb in its well, using brass wedging strips to insure a tight mechanical fit.

(2) Lubricate all expansion valve and line fittings with clean refrigerant oil. Install the expansion valve, using two wrenches to prevent rotation and twisting of lines.

(3) Connect the equalizer tube to evaporator suction line.

(4) Using two wrenches, retest all connections for tightness.

After the expansion valve is installed, it must be completely tested. The system must then be tested for leaks and recharged.

Removal—Evaporator

The evaporator assembly, expansion valve, blower motor, switches, outlet grille are compactly packaged as a single unit.

The system must be completely discharged before opening any refrigerant lines.

(1) Disconnect the battery ground cable.

(2) Disconnect the equalizer line, suction line, discharge line. Cap lines to prevent the entrance of dirt and moisture.

(3) Disconnect the clutch and feed wires.

(4) Disconnect the drains, remove the mounting bolts and remove the assembly from the vehicle.

(5) Remove the blower and base plate assembly.

(6) Remove the grille, top plate, and expansion valve.

(7) Remove the sub frame and the evaporator from the case.

(8) Remove the evaporator from the sub frame.

Installation

(1) Install the evaporator to the sub frame.

(2) Install the evaporator and the sub frame to the case.

(3) Install the top plate with the hole in lower left corner.

(4) Install the grille with switches, positioning the temperature control sensing tube through the hole in the top plate.

(5) Install the blower and base assembly.

(6) Install the assembly in the vehicle.

(7) Connect the drains, clutch and the feed wires.

(8) Lubricate the fittings and lines with clean refrigerant oil. Install the expansion valve, equalizer tube, suction and discharge lines using two wrenches to prevent rotation and twisting of the line.

(9) Connect the battery ground cable.

After the evaporator assembly is installed in the vehicle, it will be necessary to sweep the system, test for leaks, and charge with the proper amount of refrigerant. An Over-All Performance Test should be made after repair or replacement of the evaporator assembly.

Removal—Blower

(1) Disconnect the battery ground cable.

(2) Disconnect the clutch and feed wires from the switch.

(3) Disconnect the drains.

(4) Remove the mounting bolts and swing the assembly out.

(5) Remove the blower housing end plate and the base plate from the evaporator.

(6) Remove one wheel housing from the base plate and motor.

(7) Remove the motor from the second wheel housing.

Installation

(1) Install the motor to the housing and the wheel to the motor.

(2) Install the second housing to the motor and the base plate, second wheel to the motor, be sure both wheels are free and do not rub.

(3) Cement the rubber gasket to the base.

(4) Install the blower assembly to the evaporator.

(5) Swing the assembly into position and bolt down

(6) Connect the drains, clutch and feed wires to the switch.

(7) Connect the battery ground cable.

(8) Test the operation of the blower motor.

27. REFRIGERANT SERVICE

Use only refrigerant 12 in the 1964 air-conditioning system. Refrigerant 12 is available in bulk tanks or in sealed 15 ounce cans. The use of canned refrigerant

is preferred by most technicians because it provides a very quick and simple means of adding refrigerant or charging the system completely.

All 1964 Plymouth units require 2⅝ to 2⅞ pounds of refrigerant. Three 15 ounce cans of refrigerant 12 provide a complete charge without the necessity of weighing the refrigerant as it is dispensed.

The Valiant Cool Aire unit requires 2¼ pounds of refrigerant 12 for a complete charge.

NOTE: An accurate scale must be used to insure charging with the proper amount of refrigerant.

Since the use of canned refrigerant is preferred universally, only that method is described.

COMPLETE SYSTEM DISCHARGE AND RECHARGE

Before the system can be opened for replacement of lines or components, the system must be completely discharged. It is also necessary to discharge the system before performing the Compressor Capacity Test and the Expansion Valve Test. Whenever the system has been opened, it must be swept with a partial charge, and the entire system tested for leaks. The drier should be replaced and the system evacuated using a vacuum pump to remove all air and moisture. The system should then be charged with the proper amount of refrigerant. Detailed instruction for performing these operations follow.

28. DISCHARGE THE SYSTEM

(1) Be sure the valves of the gauge manifold set are closed before attaching the gauge set manifold (suction test hose to the suction service port and discharge test hose to the discharge service port). Attach the long test hose to the center connection of the gauge set manifold. Lead the other end of this hose into an exhaust ventilation system outlet or to the outside of the building.

(2) Open the gauge set manifold needle valve and close both of the gauge set manifold gauge valves.

(3) Operate the engine at 1250 rpm, windows open and the hood up.

(4) On Plymouth push in "Cool" button, blower on number 2 position.

(A) On Valiant Cool Aire set the evaporator temperature control lever to the coolest position, push in "Hi" blower button.

(5) Allow the system to operate at full capacity for at least 15 minutes. This will cause most of the compressor oil in the system to return to the compressor crankcase.

(6) Open the discharge right-hand gauge valve a small amount. This will allow the refrigerant vapor to discharge **slowly.**

CAUTION: Do not allow the system to discharge rapidly since this would sweep some of the refrigerant oil out of the compressor.

(7) Allow the system to discharge until the discharge pressure gauge registers zero. Open the left-hand valve to release any vapor trapped at the suction side of the system.

29. SWEEP-TEST CHARGE

The purpose of the sweep-test charge is to pressurize the system so that a leak test can be made. The sweep-test charge also serves the purpose of drying the system or sweeping out trapped moisture. Repairs and component replacement must be completed before charging with the sweep-test charge.

(1) Close both gauge set manifold valves and open the gauge set manifold needle valve.

(2) Attach the free end of the long hose used for discharging to the refrigerant dispensing manifold.

(3) Attach a single can of refrigerant 12 to the dispensing manifold. Place the refrigerant in 125 degree water. For detailed instructions on attaching refrigerant can for charging, see "Charging the System".

(4) Operate engine at 1250 rpm, vehicle doors, the windows open and the hood up.

(5) On **Plymouth** push in "Cool" button, blower on number 2 position.

(A) On Valiant **Cool Aire** set the evaporator temperature control lever to the coolest position, push in "Hi" blower button.

(6) Slowly open the left-hand gauge set manifold valve to meter the refrigerant into the system. When the full can of refrigerant has been metered into the system, close the gauge set manifold valves and the refrigerant manifold valve.

If the system has been opened for repair or replacement, a complete leak test must be made to make sure the system is sealed. Also, if the system has accidentally lost its charge it will be necessary to perform a leak test while the sweep-test charge is in the system. Stop the engine and disconnect the test hoses and adapters from the compressor service ports.

30. TESTING THE SYSTEM FOR LEAKS

The leak detector torch Tool C-3569 is a propane gas-burning torch used to locate a leak in any part of the refrigeration system. Refrigerant gas drawn into the sampling or "snifter" tube will cause the flame to change color in proportion to the size of the leak. A very small leak will produce a flame color varying from yellowish-green to bright green. A large leak will produce a brilliant blue flame.

CAUTION: Do not use the lighted detector in any place where explosive gases, dust, or vapor are present. Do not breathe the fumes that are produced by the burning of refrigerant gas. Large concentrations of refrigerant in the presence of a live flame become dangerously toxic. Observe the flame through the window of the burner shield, not through the top of the shield.

(1) Open the torch valve until you hear a faint hiss of escaping gas. Light the test torch and adjust the valve until the flame is very small. A small flame will detect large as well as small leaks, whereas, a large flame will detect only large leaks. As soon as the reaction plate seen through the window in the burner shield becomes red hot, the tester is ready for use.

(2) Examine all the tube connectors and other possible leak points by moving the end of the sampling hose from point to point. Since refrigerant 12 is heavier than air, it is good practice to place the open end of the sampling hose directly below the point being tested. Be careful not to pinch the sampling tube since this will shut off the air supply to the flame and cause a color change.

(3) Watch for a change in the color of the flame. Small leaks will produce a green color and large leaks a bright blue color. If leaks are observed at the tube fittings, tighten the connection, using the proper flare wrenches, and retest.

If the flame remains bright yellow when the tester is removed from a possible leak point, insufficient air

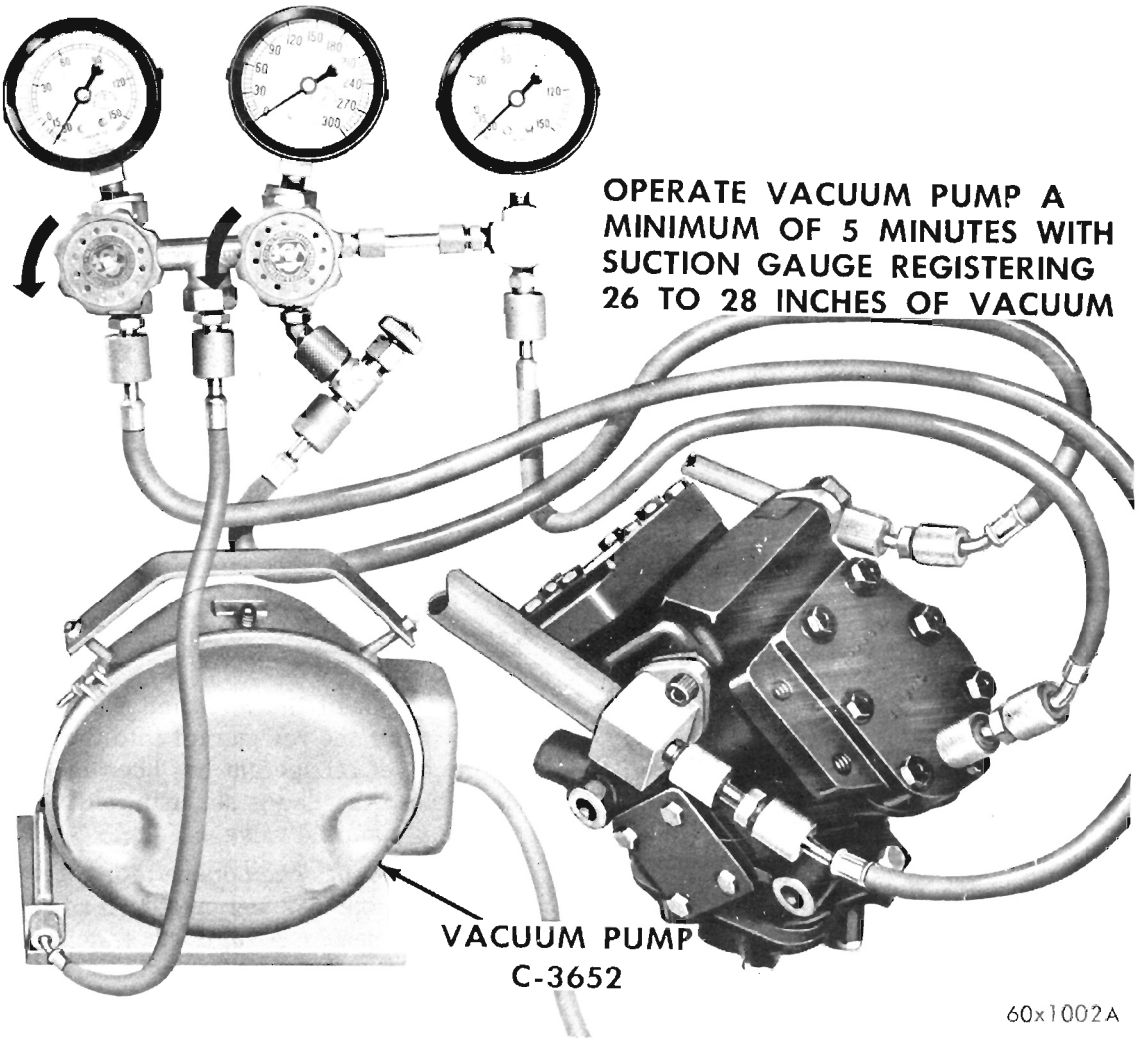


Fig. 58—Evacuating the System

is being drawn in through the sampling tube, or the reaction plate is dirty.

31. REMOVE SWEEP-TEST CHARGE

If the system is free of leaks, or after correcting a leak, if no air-conditioning components have been removed, add the necessary refrigerant as described under "Correcting the Low Refrigerant Level". If any parts of the refrigerant system were disconnected remove the sweep-test charge. Close the refrigerant manifold valve so that any refrigerant remaining in the container is sealed. Remove the long test hose from the refrigerant manifold. Insert the free end of this test hose into an exhaust system outlet. Open the right-hand gauge set manifold valve a fraction of a turn to let the sweep-test charge escape slowly. Allow the system to discharge until the discharge pressure gauge registers zero. Open the left-hand gauge valve to allow any refrigerant trapped in the suction side of the system to escape.

32. REPLACE THE RECEIVER-DRIER-STRAINER

CAUTION: Replacement receiver-drier-strainer units must be sealed while in storage. The drier used in these units is so hungry for moisture that they can saturate quickly upon exposure to the atmosphere. When installing a drier, have all tools and supplies ready for quick reassembly to avoid keeping the system open any longer than necessary.

33. EVACUATE THE SYSTEM

Whenever the system has been opened to atmosphere, it is absolutely essential that the system be swept with refrigerant and evacuated or "vacuumed" to remove all the air and the moisture. If any appreciable amount of air remains in the system when it is charged, the trapped air will concentrate near the top of the condenser and cause abnormally high discharge pressures. Air in the system will reduce the condenser's ability to condense the refrigerant gas and supply adequate liquid refrigerant to the evapo-

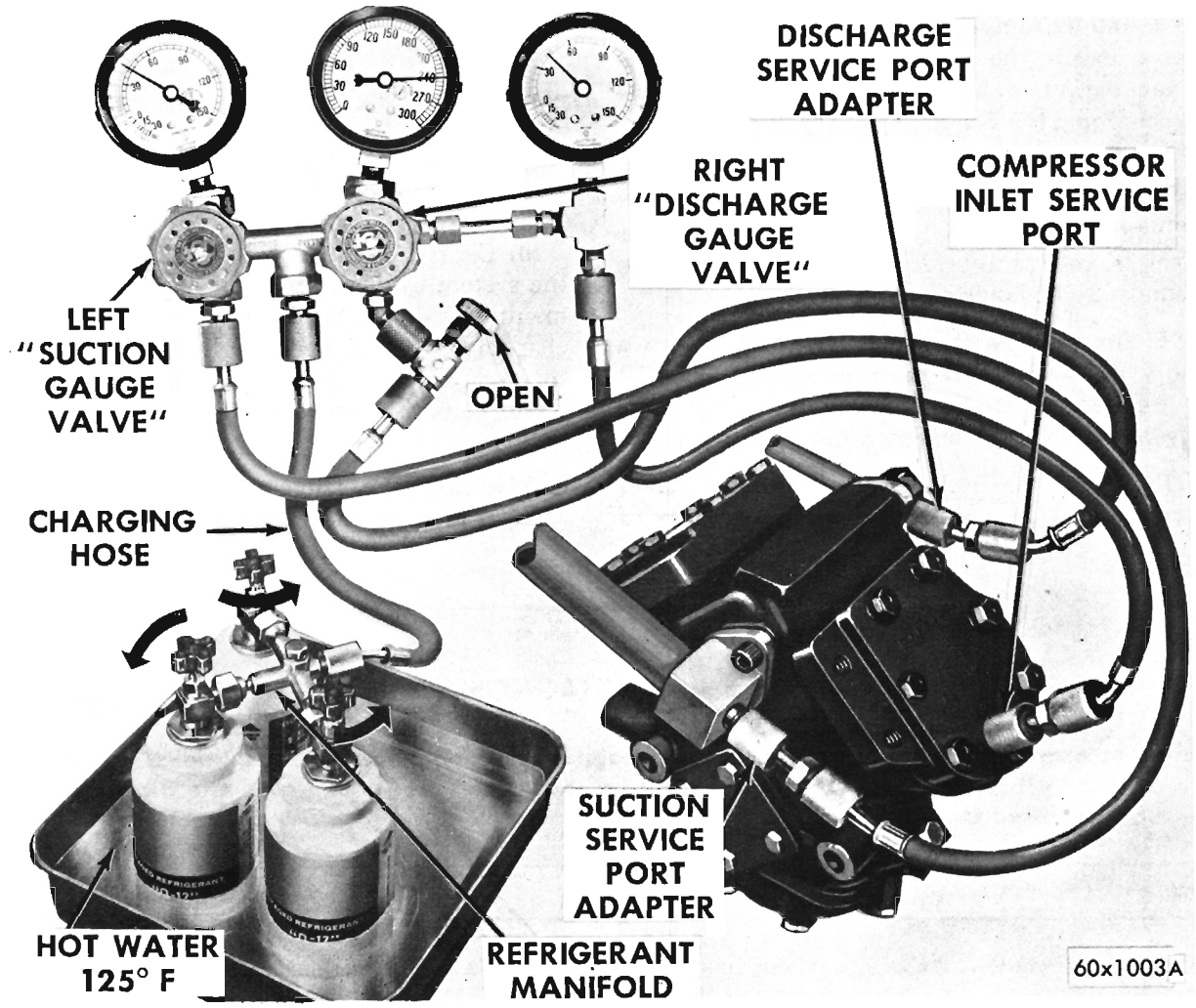


Fig. 59—Complete System Charging

rator. To evacuate the system, proceed as follows:

(1) Connect the gauge set manifold to the compressor and the long test hose from the gauge set manifold center connection to the vacuum pump Tool C-3652, as shown in Figure 58.

(2) Open both gauge set manifold valves and the needle valve.

(3) Start the vacuum pump and operate until the evaporator suction gauge registers at least 26 inches of vacuum. If the system is tight and the pump in good condition, the vacuum will go as low as 28 inches.

(4) Allow the vacuum pump to operate with suction gauge registering 26 to 28 inches of vacuum for a minimum of five minutes.

(5) Close both gauge set manifold valves, turn off the vacuum pump and remove the test hose from the vacuum pump. Leave the gauge set manifold connected to the compressor. Charge the system with the proper amount of refrigerant 12.

NOTE: Failure to pull at least 26 inches of vacuum indicates a leak in the refrigeration system or a defective vacuum pump. Locate and correct the trouble before recharging the system.

34. CHARGING THE SYSTEM (Fig. 59)

All Plymouth models only require three cans or 45 ounces of refrigerant 12. The Valiant Cool Aire units require 2¼ pounds of refrigerant 12.

NOTE: An accurate scale must be used to insure charging with the proper amount of refrigerant. The special refrigerant dispensing manifold permits charging three full cans of refrigerant at one time.

NOTE: Keep the refrigerant manifold valves capped when not in use. Keep a supply of extra refrigerant-can-to-refrigerant-manifold gaskets on hand so that gaskets can be replaced periodically. This will insure a good seal without excessive tightening of the can or the manifold nuts.

(1) Attach the center hose from the gauge set manifold to the refrigerant dispensing manifold. Turn the refrigerant manifold valves completely counterclockwise so that they are fully open. Remove the protective caps from the refrigerant manifold.

(2) Screw the refrigerant cans into the manifold. Be sure the manifold-to-can gasket is in place and in good condition. Tighten the can and the manifold nuts to 6 to 8 foot-pounds.

(3) Turn the three refrigerant manifold valves completely clockwise to puncture the cans and close the manifold valves.

(4) Turn the refrigerant manifold valves counterclockwise to open them.

(5) Momentarily loosen the charging hose at the gauge set manifold to allow the refrigerant gas to purge air out of the charging hose.

(6) Place the three cans of refrigerant into a pan containing hot water at a temperature of 125 degrees F.

(7) Start the engine and adjust the speed to 1250 rpm.

(8) Charge the system through the suction side of the system by slowly opening the left-hand gauge set manifold valve. Adjust the valve as necessary so the charging pressure does not exceed 50 psi. Maintain the temperature of the water in the pan by adding warm water as necessary.

When all three cans of refrigerant are completely empty, close the gauge set manifold valves and the refrigerant manifold valves.

SERVICE DIAGNOSIS

NOTE: No attempt should be made to use the diagnosis information as a method of trouble shooting or spot testing. When properly used (as an aid to complete test procedure), the diagnosis will be of considerable value to the service man.

Condition	Possible Cause	Correction
Blower Not Operating	(a) Blown fuse, boken wire, faulty switch motor, loose or dity connections.	(a) Test the electrical circuit with point to point voltmeter test repair or replacing the faulty parts.

SERVICE DIAGNOSIS—(Continued)

Condition	Possible Cause	Correction
Blower and Compressor Operating—No Cooling	(a) Low refrigerant, moisture, frozen, stuck or faulty expansion valve, stuck or faulty E.P.R. valve.	(a) Add refrigerant, test for leaks and repair, replace the strainer-drier, clean or replace expansion valve, replace E.P.R. valve.
	(b) Low compressor capacity.	(b) Repair or replace the compressor.
	(c) Kinks in lines.	(c) Repair or replace the lines.
	(d) Faulty water valve or out of adjustment.	(d) Adjust cable and/or replace the valve.
Blower Operating Partial Cooling	(a) Moisture, low refrigerant, low compressor capacity.	(a) Replace strainer-drier, add refrigerant test for leaks and correct, repair or replace the compressor.
	(b) Slipping clutch.	(b) Repair or replace.
	(c) Water valve out of adjustment or faulty.	(c) Adjust the cable or replace.
	(d) Obstruction of condenser.	(d) Clean the condenser, repair, replace and no Bug Screens.
Low Suction and Low Discharge Pressure	(a) Low refrigerant, moisture in system, expansion valve frozen or stuck, thermal bulb lost charge, restriction in liquid bad compressor valves, too much oil.	(a) Add refrigerant, test for leaks and correct, replace strainer-drier, clean or replace expansion valve, repiar or replace liquid line, repair or replace compressor, remove the excess oil.
High Discharge Pressure	(a) Too much refrigerant.	(a) Purge the system for 10 seconds.
	(b) Air in system.	(b) Purge the system for 10 seconds.
	(c) Dirty condenser.	(c) Clean the condenser, no bug screens.
	(d) High ambient temperature.	(d) NOTE: Discharge and Suction pressures will vary with the ambient temperature and the heat load applied to the evaporator. Normal Suction pressure will vary between 25 to 40 psi. Normal Discharge pressure at 1200 engine rpm as indicated below:

Ambient Temperature	Discharge Pressure
60°F	100-150 psi
80°F	140-190 psi
100°F	190-240 psi
110°F	230-280 psi

High Suction Pressure	(a) Moisture in system.	(a) Change the strainer-drier—recharge.
	(b) Expansion valve frozen or stuck open.	(b) Change the strainer-drier—recharge, clean or replace expansion valve.
	(c) Expansion valve equalizer tube plugged.	(c) Clean or replace the expansion valve.
	(d) Bad compressor valves.	(d) Replace the valve plates.
	(e) Not enough oil.	(e) Add oil.

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